

IN INDUSTRY • IN TRANSPORTATION • ON THE SEA • IN THE AIR

# DIESEL PROGRESS



FIVE DOLLARS PER YEAR

AUGUST 1950

FIFTY CENTS PER COPY

**FREE  
RINGS  
FOR  
EVERY  
DIESEL**

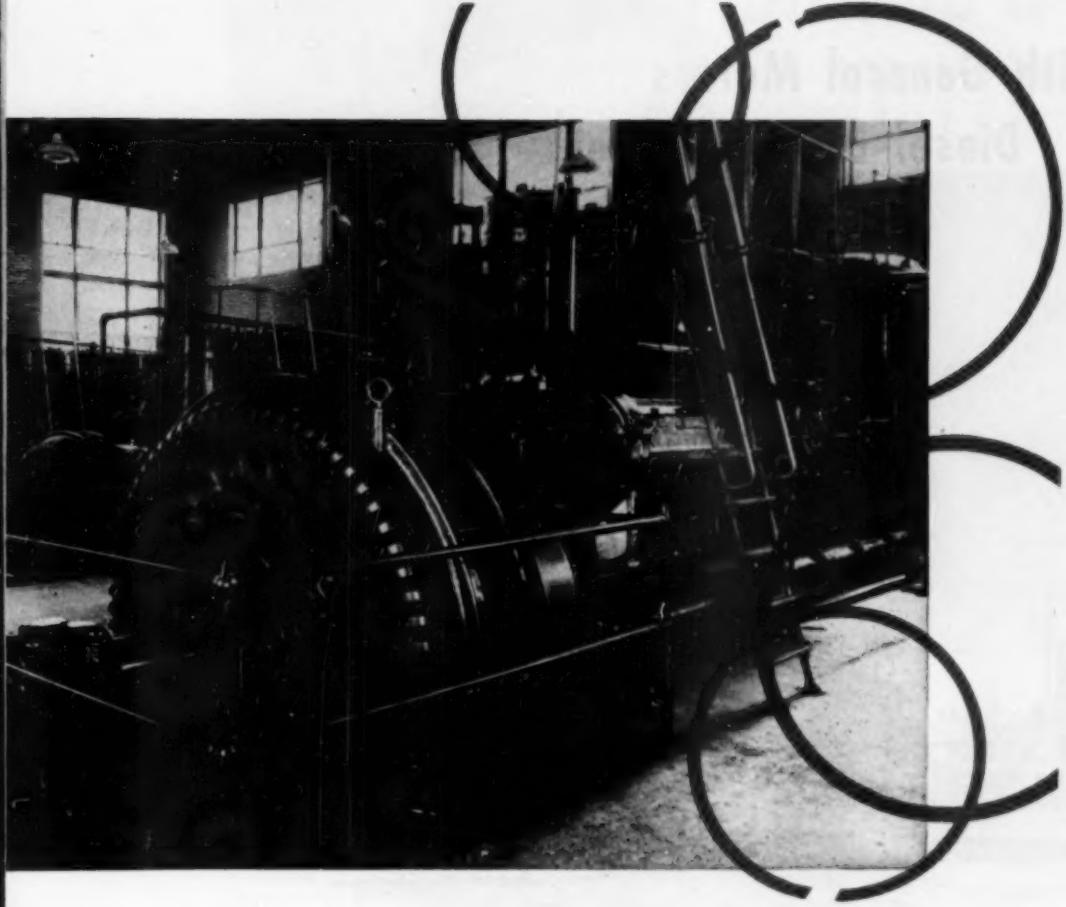
**ASSURED  
when you use  
TEXACO  
URSA OILS**

Lubricate any Diesel . . . new or old, in constant or intermittent operation...with *Texaco Ursa Oils* and you'll find an almost miraculous absence of sludge, varnish and carbon formations. *Texaco Ursa Oils* are especially made to resist oxidation and withstand the heat and pressure of Diesel operation.

That's why, with *Texaco Ursa Oils*, you'll find rings free in their grooves, giving proper seal and eliminating wasteful blow-by. That's why you'll get better compression and com-



**TEXACO**



bustion, full power from your fuel, and less fuel consumption. In addition, *Texaco Ursa Oils* prevent bearing corrosion and minimize wear. Engine parts last longer, maintenance costs come down.

There is a complete line of *Texaco Ursa Oils*, and they are easily America's most widely preferred Diesel lubricants... among leading engine manufacturers as well as operators everywhere. In fact —

*More stationary Diesel b.p. in the U.S. is lubricated with Texaco Ursa Oils than with any other brand.*

Let a Texaco Lubrication Engineer show you the way to cost-saving Diesel operation through effective lubrication. Just call the nearest of the more than 2,000 Texaco Wholesale Distributing Plants in the 48 States, or write The Texas Company, 135 East 42nd Street, New York 17, N. Y.

**URSA OILS FOR ALL DIESEL ENGINES**

# 23 Fast Tankers

all with General Motors  
Diesel-Electric Drive!

**P**ROOF of the economy and efficiency of Diesel-Electric Drive is provided by the Navy AOG-type oilers. Built to transport fuel and lube oil for aviation and small craft use, these medium-sized tankers carry 2,000-ton cargoes at 14½ knots—with remarkable economy in fuel consumption. Considering the size of ships' personnel complement—with necessary space and supplies—these ships' records are all the more important. Construction, under Navy design and specifications, was by Seattle-Tacoma Shipbuilding Co., of Tacoma, and Cargill, Inc., of Savage, Minnesota. Powered by GM Diesels.



One of the 23 AOG-type Navy oilers, powered by four 16-cylinder General Motors Diesel engines, aggregating 6,400 brake H.P.

ENGINES FROM  
150 TO 2000 H.P.



## Cleveland Diesel Engine Division

CLEVELAND 11, OHIO

GENERAL MOTORS

### SALES AND SERVICE REPRESENTATIVES

**NEW YORK, N. Y.**  
Cleveland Diesel Eng. Div.  
General Motors Corp.  
10 East 40th Street  
New York 16, N. Y.

**WASHINGTON, D. C.**  
Cleveland Diesel Eng. Div.  
General Motors Corp.  
504 Hill Building  
Washington 6, D. C.

**CAMBRIDGE, MASS.**  
Walter H. Moreton Corp.  
9 Commercial Avenue  
Cambridge 41, Mass.

**NORFOLK, VA.**  
Curtis Marine Co., Inc.  
548 Front Street  
Norfolk 7, Va.

**JACKSONVILLE, FLA.**  
Florida Diesel Eng. Sales  
General Motors Corp.  
332 E. Bay Street  
Jacksonville 2, Fla.

**TAMPA, FLA.**  
General Eng. & Equip. Co.  
103 N. Franklin Street  
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Cleveland Diesel Eng. Div.  
General Motors Corp.  
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**LIVERPOOL, NOVA SCOTIA**  
Thompson Bros. Machinery Co., Ltd.  
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General Motors Corp.  
2315 North West 14th Street  
Miami, Fla.

**NEW ORLEANS, LA.**  
Cleveland Diesel Engine Div.  
General Motors Corp.  
727 Baronne Street  
New Orleans 12, La.

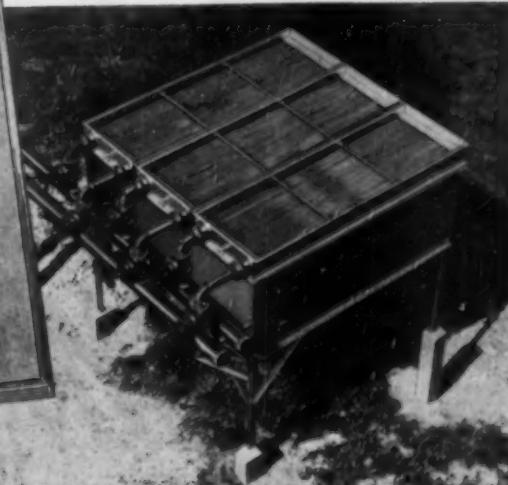
**SEATTLE, WASH.**  
Evans Engine and Equip. Co.  
1230 Westlake, North  
Seattle 9, Wash.

**VANCOUVER, B. C.**  
Hoffars, Limited  
1790 Georgia St., West  
Vancouver, B. C.

**SAN FRANCISCO, CALIF.**  
Cleveland Diesel Engine Div.  
General Motors Corp.  
445 Harrison Street  
San Francisco 3, Calif.



# RATINGS & DATA ...YOU'LL WANT



## on dry cooling equipment... DriCooler®

Whether you have an engine in a power plant — products to cool or condense in a natural gasoline plant — engines or gas to cool at a gas pipeline compressor station — high level heat dissipation in a refinery or a small standby engine to cool . . . Marley has a DRICOOLER to do your job!

Small "packaged" DRICOOLERS or large industrial units are all built to give years of dependable service. All DRICOOLERS, large or small, have finned tubes that are easy to clean, quick to drain and have been tested for long life. Proven Marley mechanical equipment insures smooth, quiet operation.

DRICOOLERS are standard in forced or induced draft, horizontal or vertical coils, steel units or asbestos-board covered redwood structures, and sections are available with various fin and tube materials and header arrangements.

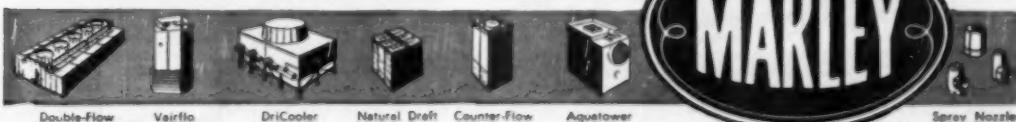
### WRITE FOR THE NEW DRICOOLER BULLETIN

- Gives rating tables for cooling water
- Lists dimensions and weights
- Shows coils, structure and mechanical equipment
- Photographs of actual installations

— MAIL THIS COUPON TODAY —

The Marley Company, Inc., Kansas City 15, Kansas  
Please send me without obligation Bulletin DC-50 on the complete line of Marley DRICOOLERS.

Name \_\_\_\_\_ Title \_\_\_\_\_  
Company Name \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ State \_\_\_\_\_





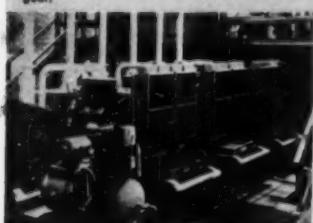
**LOCOMOTIVES**—Re-powered with GM Diesel Torque Converter unit, this 20-ton locomotive hauls double the tonnage without ever shifting into low gear.



**HOISTING**—Converted from steam to GM Diesel Torque Converter power—estimated operating savings will pay re-powering and overhaul cost in less than two years.



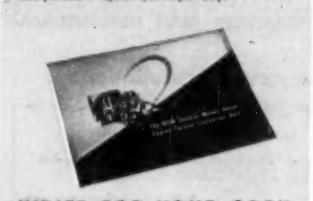
**EARTH MOVING**—Two 190 H. P. GM Diesel Torque Converter units give 34-ton Euclid 1-PFD rear dump a speed of 33.4 m.p.h. with full load.



**DRILLING**—"1/2 faster than with original engines," says owner of rig re-powered with 3 GM "Twin" Diesel Torque Converter units.



**LOGGING**—Powered with GM Diesel Torque Converter unit, this Washington iron Works yarder has yarded 140,000 bd. ft. per day.



**WRITE FOR YOUR COPY**  
of 24-page illustrated catalog giving full details  
on design, operation and application of "The NEW  
General Motors Diesel Engine-Torque Converter  
Unit."

## How to Get **MORE WORK** from your Equipment

Operators in every field report they get more work done in less time at lower cost with equipment powered by General Motors Diesel Engine-Torque Converter units.

The combination of a GM Diesel engine with an integrally built torque converter and fluid coupling provides a compact power unit which makes available maximum engine horsepower and torque regardless of the speed of the load. It delivers high torque for starting heavy loads and automatically shifts to fluid coupling when load requirements equal engine torque. Gear shifting is cut to a minimum—often eliminated. Smooth transmission of power through a fluid, protects both engine and driven machinery from sudden shock loads—prevents engine stalling under any load condition.

These efficient Diesel Engine-Torque converter units are available with 3-, 4-, and 6-cylinder engines, Twin 4 and Twin 6 multiple engines, rated at 64 to 294 B.H.P. See your GM Diesel distributor or write us for further information.

### DETROIT DIESEL ENGINE DIVISION

SINGLE ENGINES...Up to 275 H.P.      DETROIT 28, MICHIGAN      MULTIPLE UNITS...Up to 800 H.P.  
GENERAL MOTORS

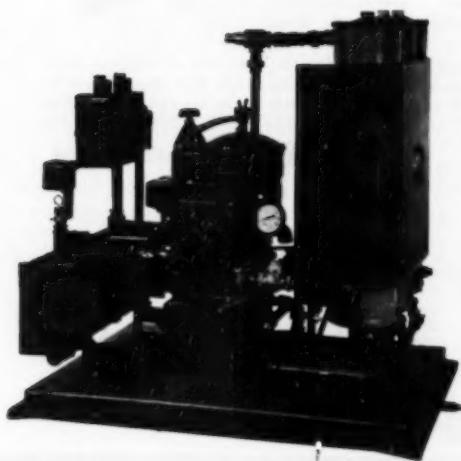
DIESEL BRAWN WITHOUT THE BULK



**3** YEARS OF EXPERIENCE PROVE  
THE PURI-FILTER TO BE A SURE

The De Laval "Puri-Filter" — centrifuge plus filter — has now been on the scene approximately three years. The numerous installations made during that time now give ample proof that the basic idea behind the "Puri-Filter" is correct. Centrifugal force and micronic filtration can do a more thorough job of cleaning diesel oil than any other device in existence, and better, in fact, than either centrifugal force or filters by themselves. It is economical, too — the centrifuge relieves the load on the filters and lets them remain in service longer.

The De Laval "Puri-Filter" removes the materials that cause ring sticking, sludging and coking. Dirt, water and colloidal carbon are all promptly separated out of the oil, which is left clean and clear in color, and ready for indefinite re-use.

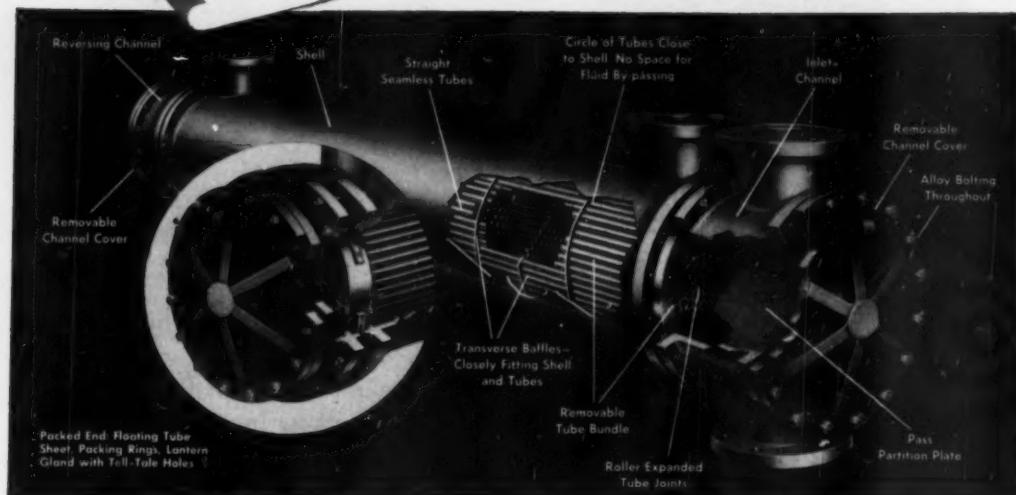


THE DE LAVAL SEPARATOR COMPANY  
165 Broadway, New York 6 427 Randolph St., Chicago 6  
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5  
THE DE LAVAL COMPANY, Limited, Peterborough, Ont.

**DE LAVAL**  
*Oil Purifiers*

■ FOR DIESEL LUBRICATING OIL ■

**now a smaller exchanger  
to handle a larger volume**



**Ross Research Reduces Size-Cost Requirements For Many Installations**

For years, one of industry's most widely used, removable bundle exchangers, Ross Type CP now offers still more heat transfer capacity without increase in size.

As a result, it is possible in many instances for a smaller, less costly exchanger to handle a volume formerly calling for a larger unit.

**MORE TRANSFER SURFACE — INCREASED TRANSFER RATE**

A new tube layout, incorporating an added circle of tubes close to the shell (in the space so frequently left open in conventional designs) not only increases surface, but improves flow characteristics. Moreover, new techniques achieve closest possible clearances with utmost accuracy and uniformity, adding substantially to heat transfer rate.

**LOW FIRST COST — QUICK DELIVERY**

Add savings in space and cost, to the already well known benefits of low purchase price and quick delivery made possible through standardization and

stocking of parts, and it's easy to see why Ross Type CP, now more than ever, is industry's leading removable tube bundle type exchanger.

**FREE CATALOG**

Get details on these and other famous Ross features such as easy-to-clean, straight tube design . . . wide latitude of connection locations . . . ease of installation . . . in new file-size Bulletin 2.1K1. Write.



ROSS HEATER & MFG. CO., INC., Div. of American Radiator & Standard Sanitary Corp., 1425 West Ave., Buffalo 13, N. Y. In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

**ROSS**

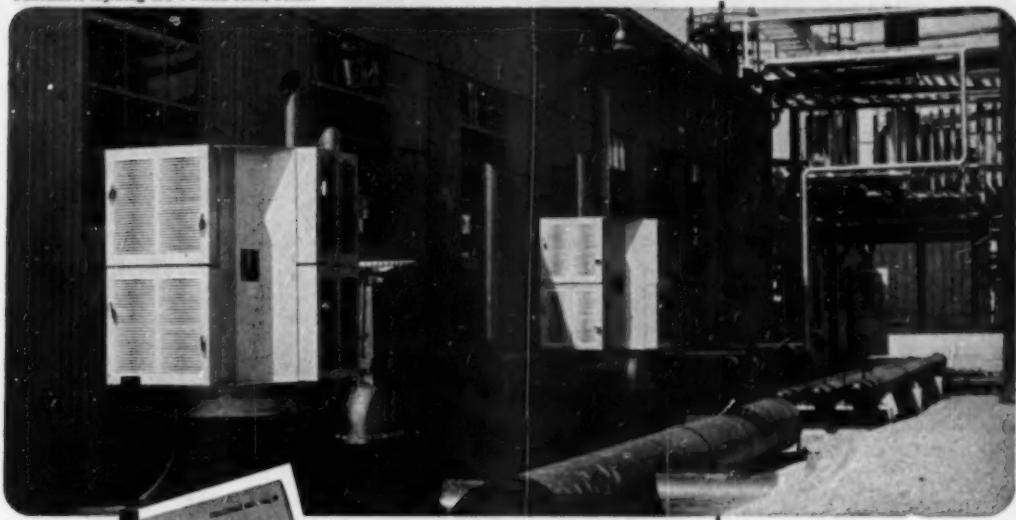
**EXCHANGERS**

*Serving home and industry*

AMERICAN STANDARD • AMERICAN FLOW • AMERICAN AIR • CROWN INSULATOR • HAWAYE ADIPEN • ROSS HEAT • TONAWANDA IRON

# These "Cats" get Longer Life

Panhandle Refining Co., Wichita Falls, Texas.



## Engineered Air cuts refiners' costs

REFINING petroleum, just as the term implies, means getting rid of impurities. Even the catalytic compounds have to be kept clean and that meant frequent replacement of catalysts . . . expensive but necessary.

Engineers reasoned a good way to stop contamination of costly catalysts was to catch dirt at the start—capture it at the air intake.

Because AAF makes every kind of air filter, expressly for particular air cleaning problems, those catalysts have longer life now. In the picture above you see AAF Type OCH on the job. Six units in the housing behind those weather louvres maintain a strict "keep out" attitude toward air borne dirt. Filters can be taken out, cleaned quickly and replaced.

The catalytic process functions better with clean air. The catalytic compound stays in service far longer, saving dollars for the refiner.

AAF equipment can be on the job for you. Why not call in the air experts, let AAF find a "profit in the air" for you. Just write to the address below.

AIR FILTERS  
AND DUST CONTROL EQUIPMENT



American Air Filter

COMPANY, INC.

408 Central Avenue, Louisville 8, Ky., In Canada: Darling Bros., Ltd., Montreal, P. Q.



# \*PENETRATION

Peak production . . . without worry of breakdown due to friction and wear . . . is made easier with Tycol high quality greases.

Made to "absorb punishment" without thinning down and dripping, Tycol greases avoid wasted lubricant, lost bearings and unnecessary down-time. These ultra-safe lubricants keep bearings . . . gears . . . shafts . . . friction-free and cool. They are available in grades with the proper "**\*PENETRATION**" needed to give power a chance to produce with a minimum of waste.

Call your nearest Tide Water Associated office. Let them suggest the Tycol grease best suited to your needs . . . and remember, Tycol green cast greases are made from high quality cylinder stock and well refined neutral oil, with a minimum of soap — a maximum of oil . . . more efficient lubrication per pound of grease.

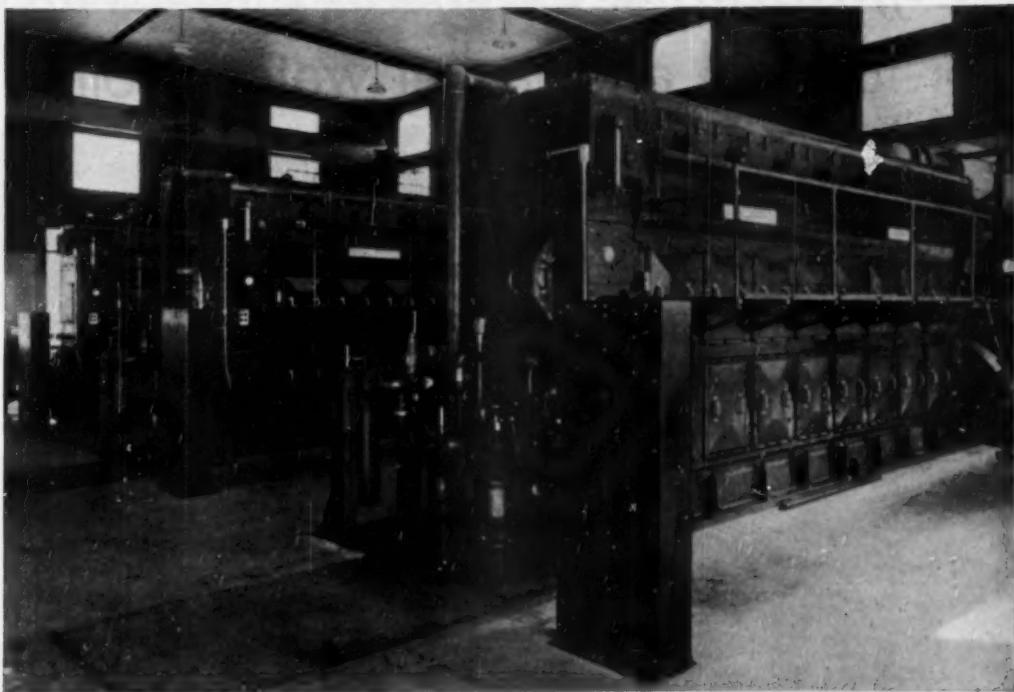


Boston • Charlotte, N. C. • Pittsburgh • Philadelphia • Chicago  
Detroit • Tulsa • Cleveland  
San Francisco • Toronto, Canada



\*LEARN WHAT THIS PRODUCT CHARACTERISTIC MEANS TO YOU — READ "LUBRICANIA"  
This informative handbook, "Tide Water Associated Lubricania," gives clear, concise descriptions of the basic tests used to determine important properties of oils and greases. For your free copy, write to Tide Water Associated Oil Company, 17 Battery Place, New York 4, N. Y.

REFINERS AND MARKETERS OF VEEDOL — THE WORLD'S MOST FAMOUS MOTOR OIL



## This Power Plant Will Pay For Itself in Two Years

In May 1949 a new Missouri generating plant went into service with three Dual Fuel Superior engines. This new power plant replaced a steam turbine system of the same kilowatt capacity that was only 11 years old. Yet the new system saved \$10,000 in its first four months of operation.

BUT that's only the beginning of their savings. Within the next few months pipeline expansion will make natural gas available. And when hooked-up, it will only be necessary to push a button on the engine to switch from oil to gas or gas to oil. This use of gas will about double the savings on power, according to the plant's chief engineer.

Present plans call for adding a fourth Dual Fuel

Superior. And when the new unit is placed in service, the plant's rate of savings will increase to the point where its entire cost will be paid off in less than two years.

One of our representatives can give you all the details on this and other Superior Diesel installations. Chances are, he can help you accomplish the same results. Just write and tell us when he should call. Or, if you prefer, send for our new, fully illustrated booklet, *Superior Diesel for Stationary Application*.

### THE NATIONAL SUPPLY COMPANY

SUPERIOR ENGINE DIVISION

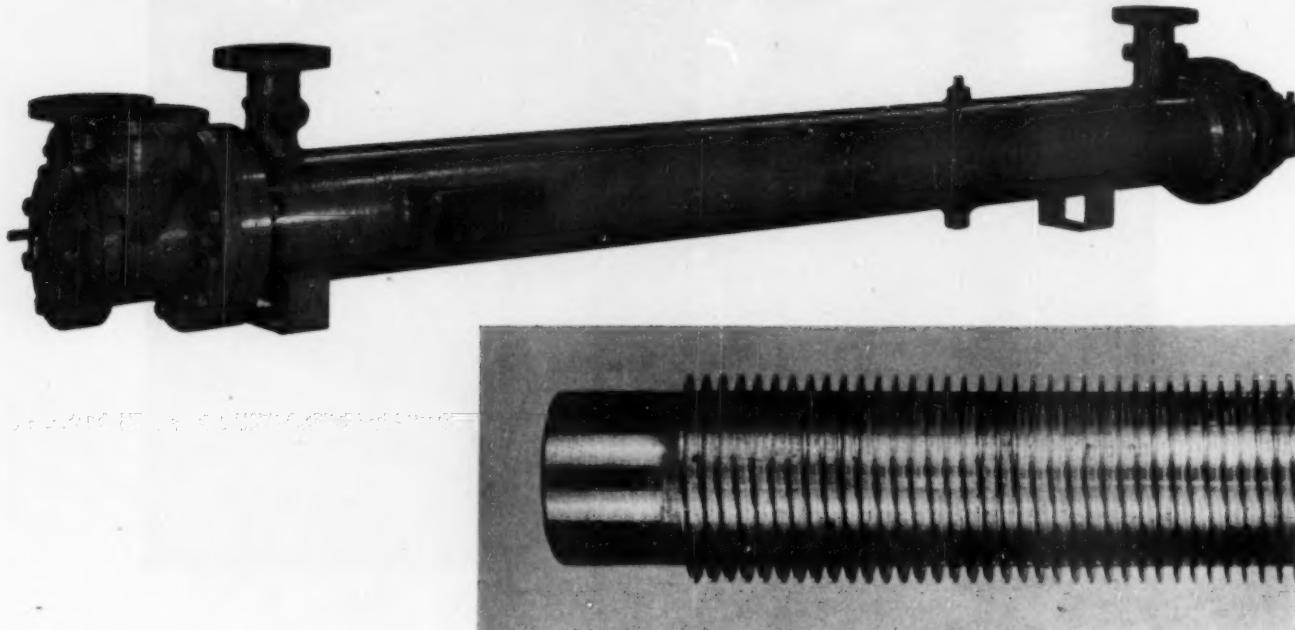
Plant and General Sales Office: Springfield, Ohio



*Superior*  
**DIESELS**

Locomotive - Marine - Oil Field - Stationary

# Why the LK-FIN Exchanger *is more effective... more compact... more economical* for lube oil and jacket water cooling



When cooling apparatus was first applied to Diesel engine lube oil and jacket water more than 50 years ago, the coolers were of the traditional type . . . a bundle of conventional bare tubes within a shell. That was the only kind of cooler known in those days.

But since then, many major improvements have been made in heat transfer apparatus. One of the most important of these developments has been FINNED heat transfer surface . . . that is, tubes with fins attached to the outside. These fins greatly increase the external heat transfer surface, thereby permitting a considerably shorter tube to perform the same cooling effect that requires a much longer bare tube.

Griscom-Russell has pioneered in the development of finned type heat transfer equipment for almost 20 years. Now Diesel engine users can have

the benefit of this development as applied to lube oil and jacket water coolers.

The result . . . more effective heat transfer because of the finned tubes . . . a more compact cooler because of the more effective heat transfer surface . . . a more economical unit because of the shorter tubes and shell.

The LK-FIN Cooler has many additional advantages, too. The tubes are free to expand and contract. An outside packed gland at the floating end permits detection and elimination of leakage. Tube interiors are readily accessible at the stationary end without disconnecting piping. The coolers are built as stock units.

Complete description, specifications and prices will be sent without obligation.

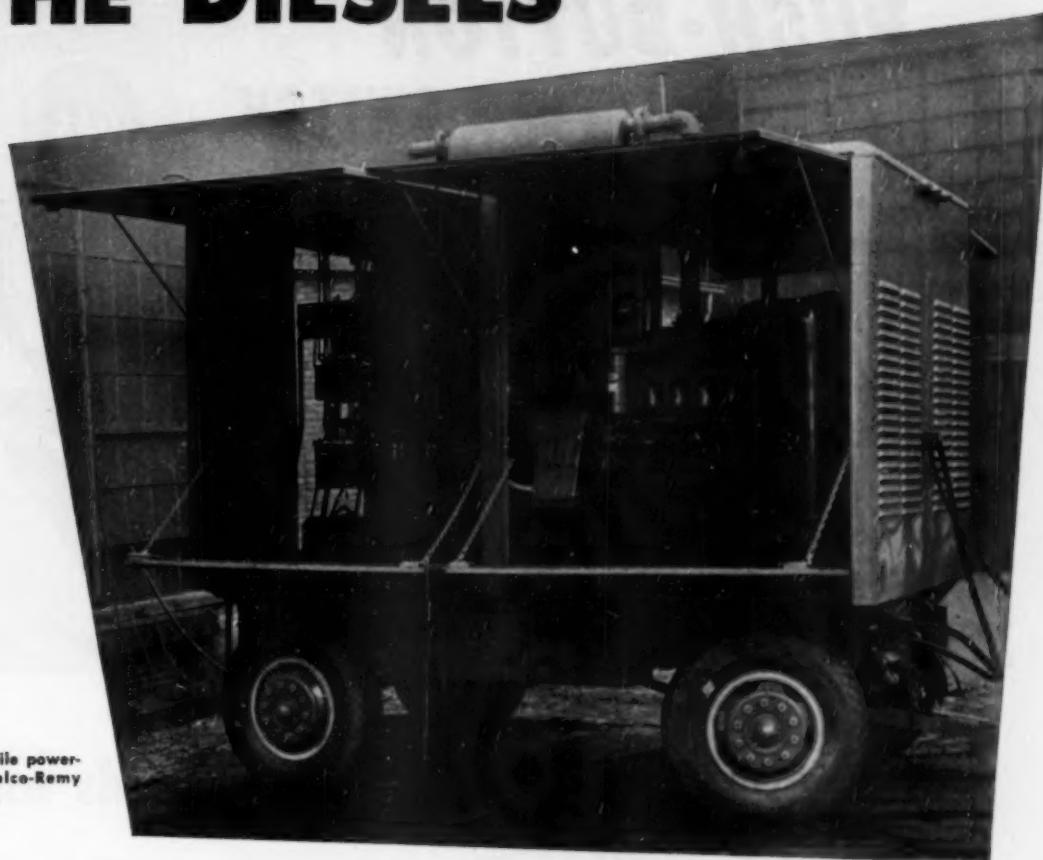
THE GRISCOM-RUSSELL CO., 285 Madison Ave., New York 17, N. Y.

## GRISCOM-RUSSELL



DIESEL PROGRESS

# DELCO-REMY ON THE DIESELS



GM Diesel mobile power-plant with Delco-Remy cranking motor.

## DIESELS ON THE JOB

Mobile powerplants for circus lighting and for numerous other applications are now largely Diesel-powered.

On the Diesels, as in the application shown, you'll usually find Delco-Remy electrical equipment.

Diesel plus Delco-Remy is a combination well known for *reliable performance*.



DELCO-REMY—A UNITED MOTORS LINE  
Service Parts and Delco Batteries  
Available Everywhere Through  
UNITED MOTORS DISTRIBUTORS

# Delco-Remy

DIVISION, GENERAL MOTORS CORPORATION  
ANDERSON, INDIANA

DELCO-REMY • WHEREVER WHEELS TURN OR PROPELLERS SPIN

AUGUST 1950

11

# FULTON pioneers **PUSH-BUTTON** **DUAL FUEL SWITCH\***

**2-second change-over by remote control...  
without missing a beat or leaving your seat!**

Now you can switch even the biggest Dual Fuel FULTONS  
up to 4000 HP from either fuel to the other:

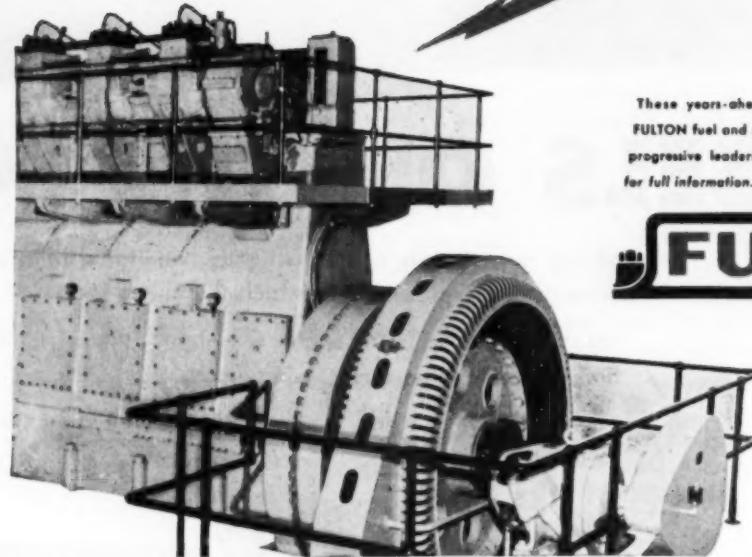
- not in 8 to 10 hours, but two seconds...no interruption in service
- not by costly adjustments, but by pushing a button right in your office (or at multiple control points anywhere in the plant)

And that's not all! In case of emergency,

- FULTON Dual Fuels AUTOMATICALLY switch to oil if the gas line pressure drops!



\*U. S. Patent 2,509,940



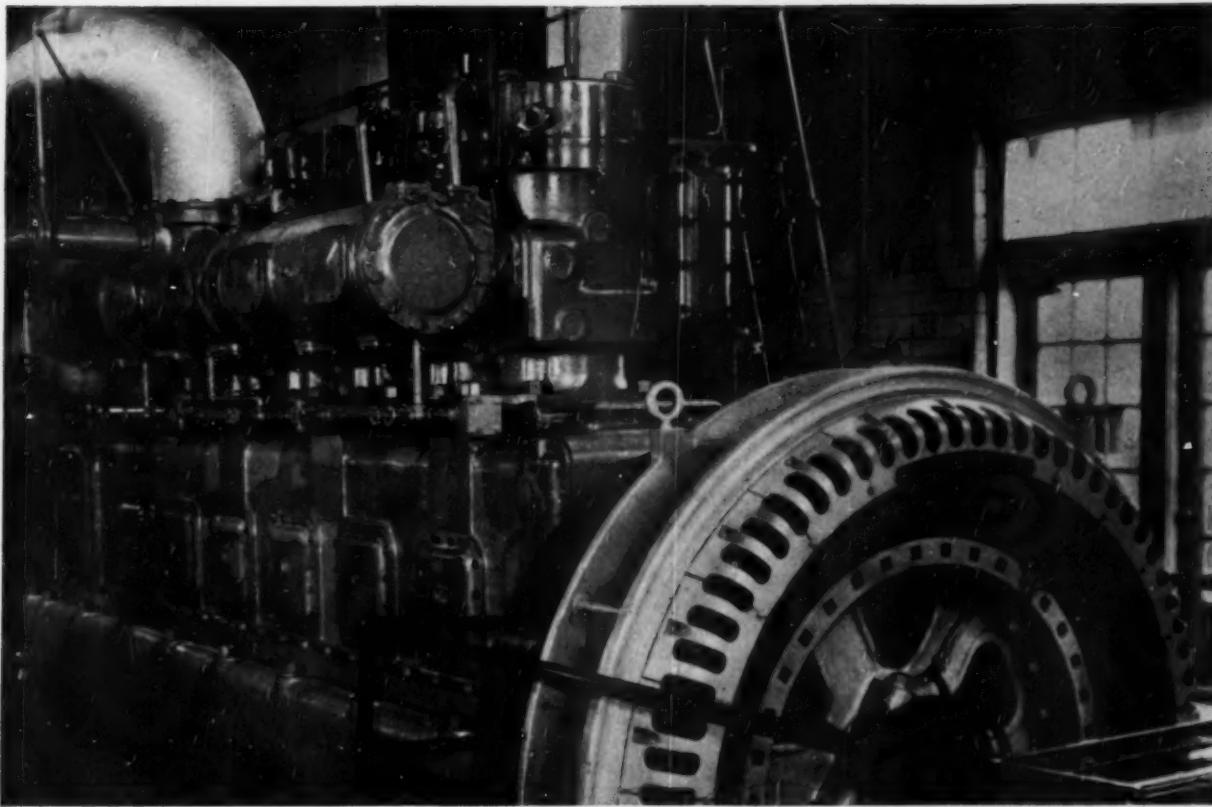
These years-ahead advancements, added to traditional FULTON fuel and maintenance economy, confirm FULTON'S progressive leadership in the Dual Fuel field. Write today for full information.

## FULTON



FULTON IRON WORKS COMPANY

SAINT LOUIS 14, MISSOURI • NEW YORK OFFICE: 82 WALL STREET, NEW YORK 5



## Slim chance, now, for diesel failure

• When peak loads demand its use, this auxiliary Diesel engine must deliver power without fail at a midwest hydro-electric plant. Operators, therefore, were concerned about continuous trouble from sludge, varnish, and stuck rings.

Conventional and detergent-type lubricants tried in the Diesel failed to remedy the troubles. A Standard Oil lubrication specialist suggested the engine be switched to STANDARD HD Diesel Oil, a truly heavy-duty lubricant in which effective detergent qualities and high oxidation resistance are combined.

STANDARD HD has now been used in the auxiliary engine since January 1946. Ring sticking and deposit troubles have been completely eliminated. Cylinder wear and



oil consumption have each been reduced to a minimum. There have been no power failures due to lubrication difficulties.

The STANDARD HD qualities that solved this lubrication problem will reduce maintenance and boost the reliability of your Diesel engines.

These superior lubricating qualities have proved themselves again and again in all types of Diesel engines under the most severe conditions of operation. A Standard Oil lubrication specialist will be glad to show you typical case histories.

Arrange for his visit, now, by writing to: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.

**STANDARD OIL COMPANY (INDIANA)**



# Who Started Engine Builders Using ALUMINUM?

You did. Engine builders turned to aluminum when you and thousands of other diesel users demanded lighter, smaller, more powerful diesels. With aluminum, they have the weight of super-charger housings, crankcases and frames. In moving parts—like pistons, connecting rods, super-charger impellers—they lessen vibration and lower inertia with aluminum. And save *still more* weight.

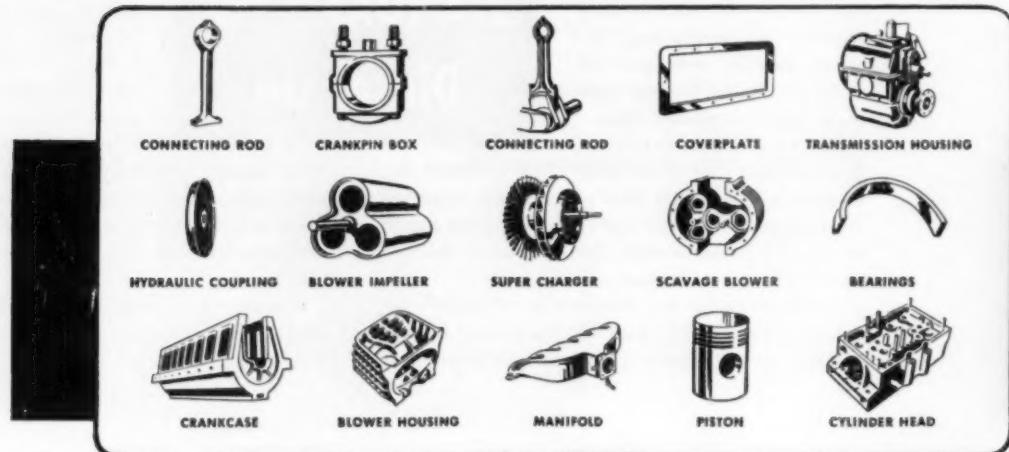
How was size reduced? By helping engines work harder. Aluminum lets pistons and rods move faster. Pistons and heads of aluminum can soak up the extra heat of higher mean effective pressures and piston speeds. Another way of saying aluminum makes engines lighter, smaller and/or more powerful.

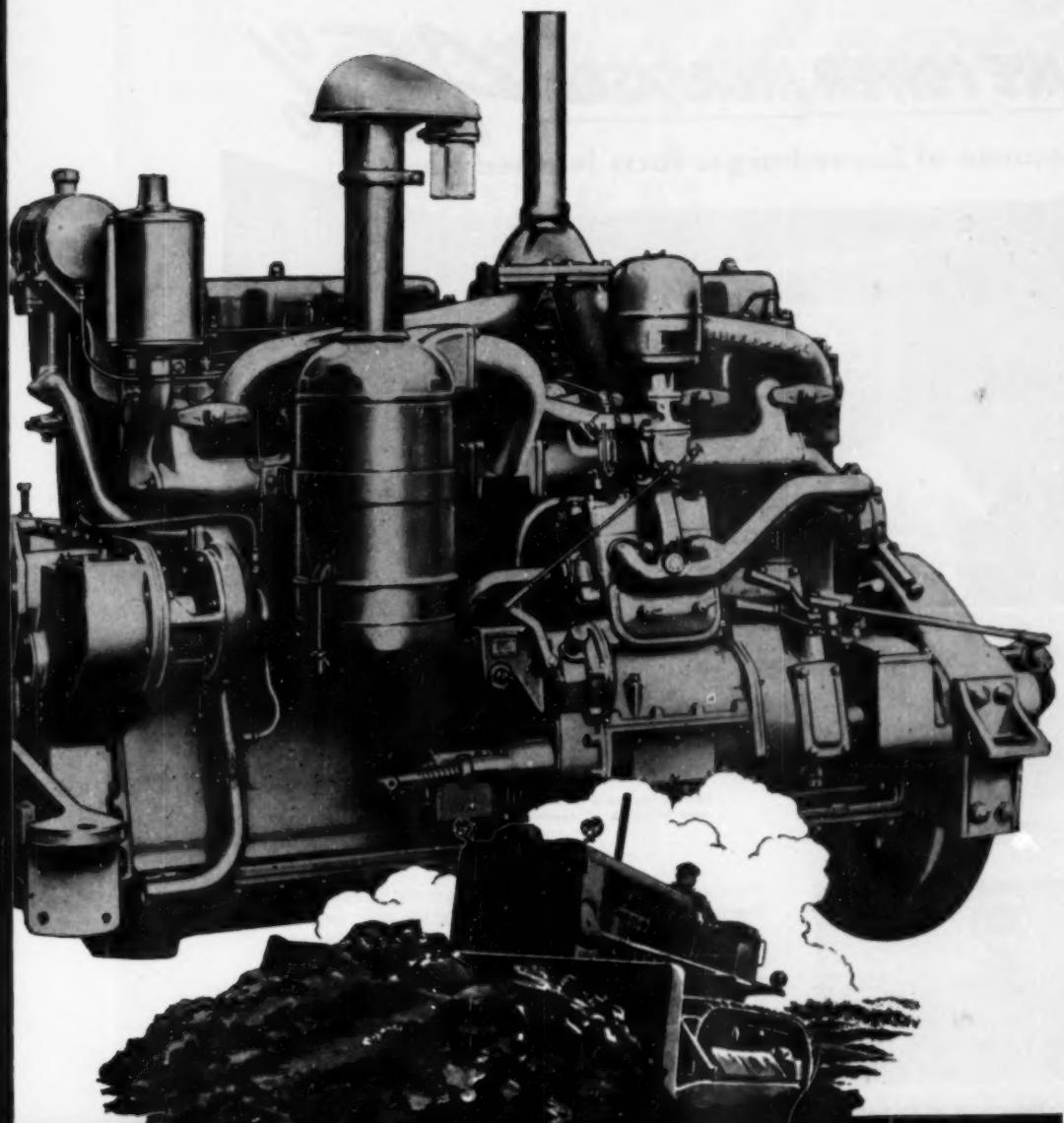
Then consider aluminum bearings. Solid metal. No hard backing to score expensive shafts. They rate highest in fatigue strength—highest in thermal conductivity—highest in strength at elevated temperatures. Additive oils don't corrode them—no inhibitors needed.

All of which adds up to more availability—better performance when you make sure your engine builder uses aluminum liberally.

## IF YOU BUILD DIESEL ENGINES...

Alcoa supplies engine builders with semi-finished parts from 5 modern foundries, 2 forge shops, 2 die casting plants. Alcoa researchers have worked with engine builders for the past 25 years in developing lighter, smaller, more powerful diesels. For complete information, write: ALUMINUM COMPANY OF AMERICA, 2101H Gulf Bldg., Pittsburgh 19, Pa.





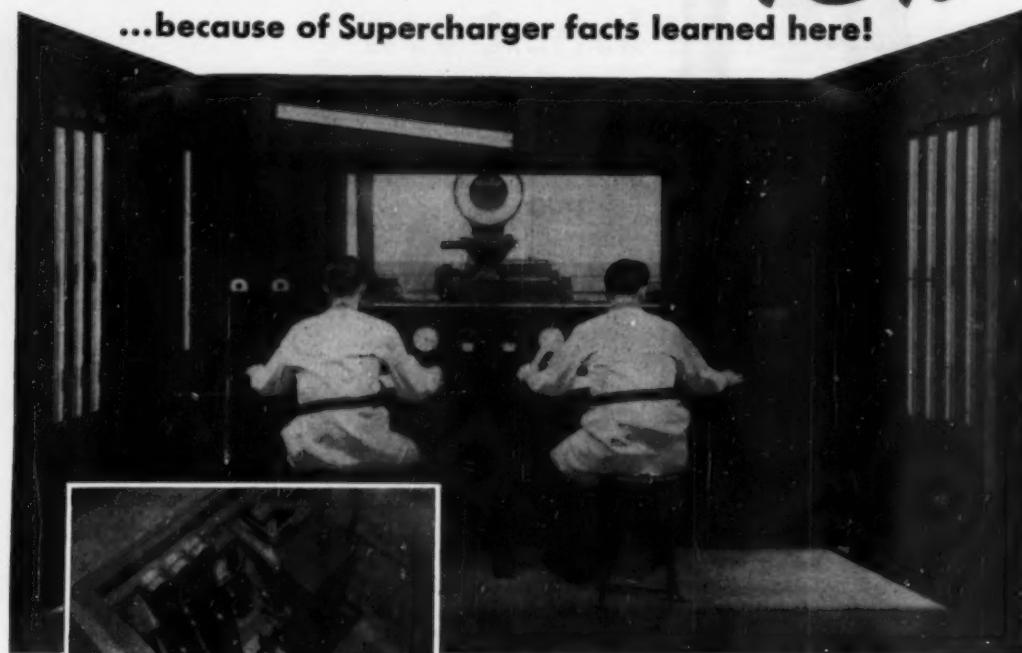
# ALCOA FIRST IN ALUMINUM



INGOT • SHEET & PLATE • SHAFTS, WHEELS & EXTRUDED • WIRE • ROD • BAR • TUBING • PIPE • SAW BLADE & PERMANENT MOLD CAST • ROD • FORGINGS • IMPACT EXTRUSIONS  
ELECTRICAL CONDUCTORS • SCREW MACHINE PRODUCTS • FABRICATED PRODUCTS • FASTENERS • FOIL • ALUMINUM PIGMENTS • MAGNESIUM PRODUCTS

**ENGINE POWER INCREASED 45%**

**...because of Supercharger facts learned here!**



Looking into one of the test cells from the central observation room in which all conditions of the test are controlled.

The centrally-located and remotely-controlled oil system for Supercharger and equipment operation.

An observer's view of equipment and superchargers on test.

Here, in the world's finest supercharger test laboratories, Pesco engineers are daily searching for new ways to increase the flexibility and performance of gasoline and Diesel engines *without increasing their weight and size*.

In these supercharger laboratories in the new Pesco plant are all the facilities and equipment that 10 years of research and experience have shown to be necessary and desirable for the continued and expanding development of superchargers, and for investigating supercharged engine performance.

From these tests have come the facts that mean increased performance, better acceleration and more reserve power under all conditions of engine operation . . . facts that mean as much as 45 per cent **MORE POWER** from the same engine.

For the complete story of what B-W Superchargers can do for your Diesel or gasoline engine, write today.

**PRODUCTS DIVISION**

**BORG-WARNER CORPORATION**

24700 NORTH MILES ROAD      BEDFORD, OHIO

# promise of profit...

IT'S POWERED BY  
**FAIRBANKS-MORSE**



Newest additions to the menhaden fleet, the White Gold and sister ship Black Gold, are powered by 375 hp. Fairbanks-Morse Model 31's—durable, efficient promise of long, low-cost and profitable operation. Fairbanks, Morse & Co., Chicago 5, Ill.

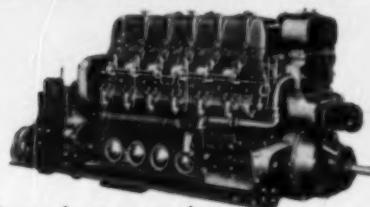


**FAIRBANKS-MORSE,**

a name worth remembering

DIESEL LOCOMOTIVES AND ENGINES • ELECTRICAL MACHINERY  
PUMPS • SCALES • HOME WATER SERVICE AND HEATING EQUIPMENT  
RAIL CARS • FARM MACHINERY

#### NEWEST MARINE ENGINE



Is easier to service,  
more power per pound!

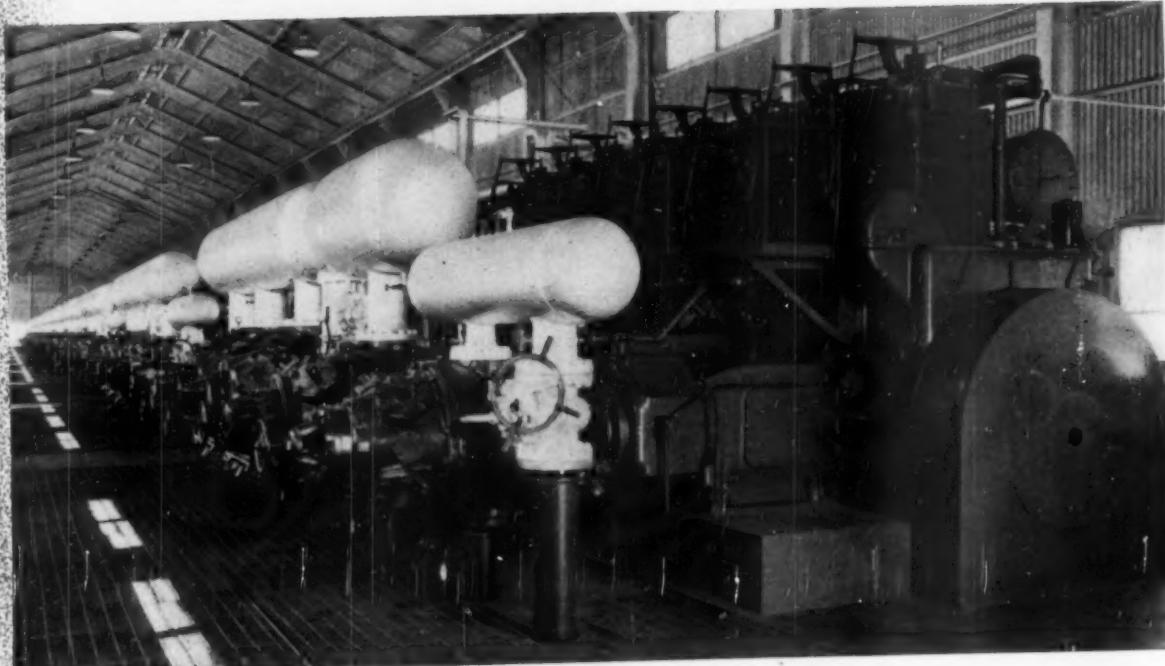
Here's the new Model 49—20 to 150 hp. marine engine. The Model 49 is built of lighter, stronger alloys, packs more power in less space. Integral cylinder head and liner assembly is removed as a unit, without dropping the pan. Makes over-haul a half-day job. Send for bulletin.

*Marquette*

# HYDRAULIC GOVERNORS

Regulate the Speed of These

1600 H. P. CLARK BROS. GAS ENGINE COMPRESSOR UNITS



The

**Marquette**

METAL PRODUCTS CO.

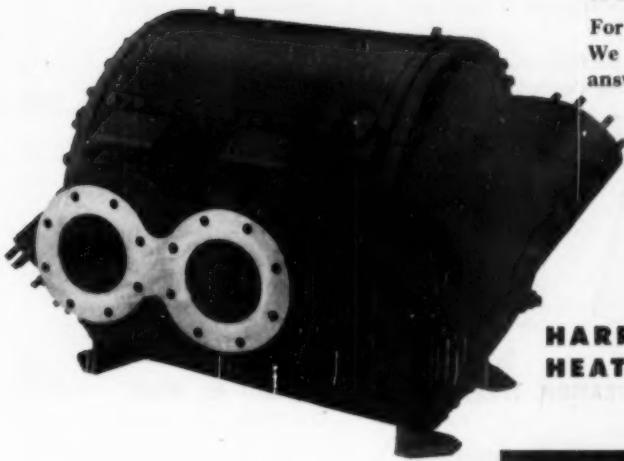
CLEVELAND 10, OHIO

SUBSIDIARY OF CHICAGO HARVEY CORPORATION

BOLTED BEARINGS, TEXTILE SPINNING  
WORLD WIDE PETROLEUM, STEELS AND TUBES  
FUEL OIL PUMPS AND INJECTORS  
PRECISION PARTS AND CYLINDRICAL

DIESEL PROGRESS

# NO STONE IS LEFT UNTURNED



**HARRISON  
HEAT EXCHANGERS**

**HARRISON**

**HARRISON RADIATOR DIVISION, GENERAL MOTORS CORPORATION, LOCKPORT, N. Y.**

Harrison heat exchangers answer the requirements of all manufacturers of Diesel equipment. For Harrison coolers are designed, tested and produced by experienced personnel—who use the most modern equipment and are backed by years of time-tested know-how.

No stone is left unturned to meet the exacting needs of our customers. Our production facilities are the largest in the country—our design and engineering staff has long specialized in solving heat transfer problems. And we maintain an experienced field organization to help our customers get the most out of their installations.

For complete details write or call us. We stand ready at all times to answer your heat transfer problems.

- ✓ LONGER BEARING LIFE
- ✓ HIGHER PERFORMANCE STANDARDS

**FEDERAL-MOGUL**

*Sintered* **COPPER ALLOYS**



Investigate the advantages of superior bearing performance available through our exclusive method of sintering copper lead alloys.

In this process each tiny particle of powder is a true alloy of the desired proportions of copper and lead. In

the finished bearing this process has created a known and controlled grain structure, of exceptional purity, with excellent lead distribution and with no segregation. Its ductility and strength are superior to cast materials of comparable analyses.



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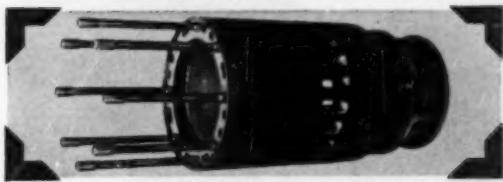


*Over 50 Years of Continuous Bearing Experience*

# STANDARD ENGINEER'S REPORT

DATA	
LUBRICANT	RPM DELO Oil R.R.
UNIT	Locomotive Diesel G.M.567B
TRAIN	"California Zephyr"
SERVICE	San Francisco-Salt Lake
FIRM	Western Pacific R.R. Co.

Only 0.002 inch cylinder wear in 1/2 million miles!



515,720 MILES WITHOUT REPLACEMENT of a single part was the record for all 48-cylinder assemblies in a "California Zephyr" diesel locomotive when this one was pulled for inspection. Lubricated with specially compounded RPM DELO Oil R.R., the engines stay in continuous service a full million miles without time off for overhaul!



"THE CALIFORNIA ZEPHYR," new streamliner with Vista-Dome cars, runs daily both ways across the continent. Only 3 diesel locomotives keep it on schedule between San Francisco and Salt Lake.



NO RING TROUBLE or lacquer deposit problems have been encountered in this long service, as this unretouched photo of the piston indicates. The cylinder "miked" only 0.002 inch taper and 0.0005 inch out of round.



WRISTPIN BUSHING IN PERFECT CONDITION! Measurement proved the bushing was still "standard" after the more than  $\frac{1}{2}$  million miles of service! RPM DELO Oil R.R. will not corrode silver bushings. All parts were put back in service.

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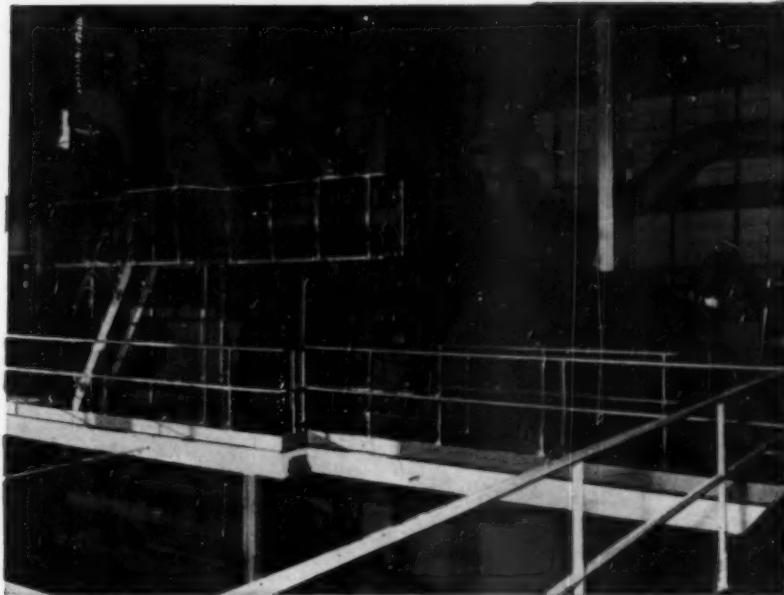
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Diesels equipped with Koppers Piston Rings! Check up on your Diesel operating costs today . . . and next time you overhaul, specify Koppers!

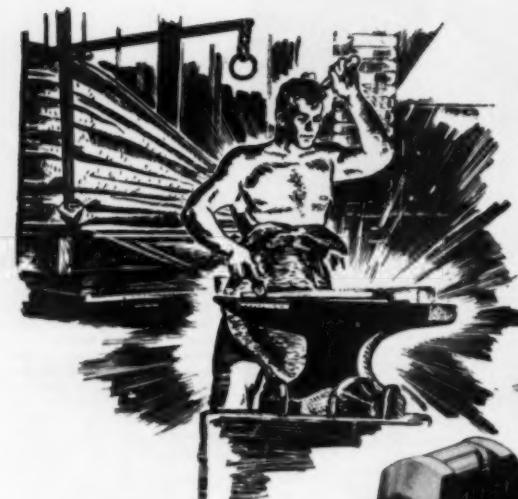
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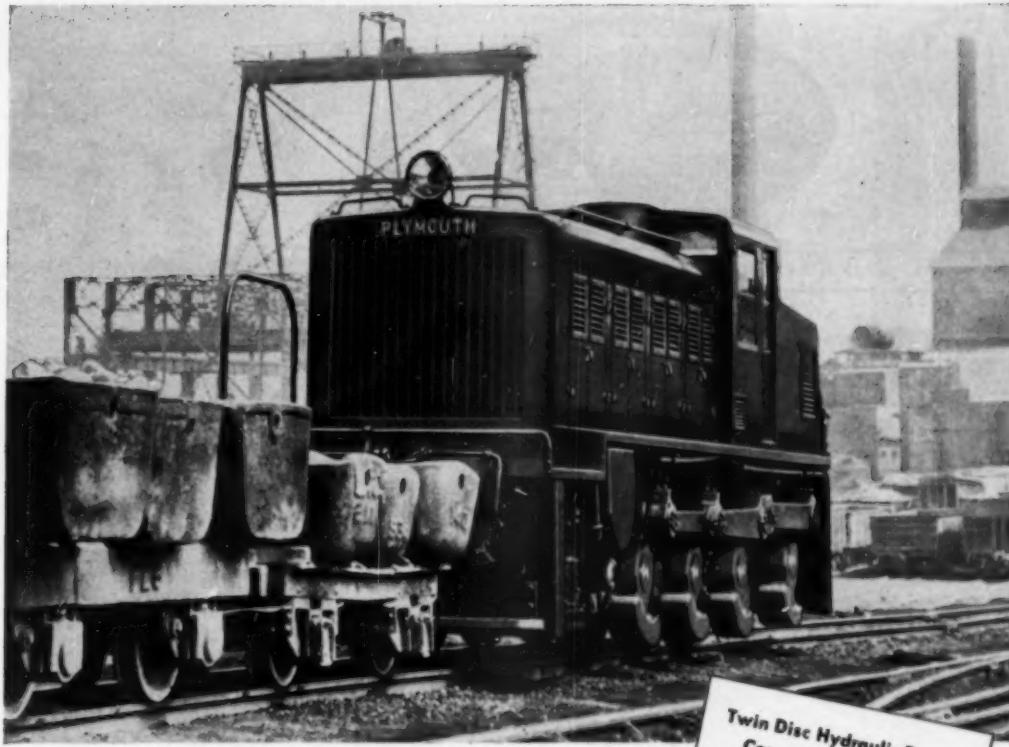
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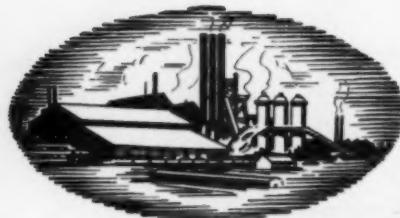
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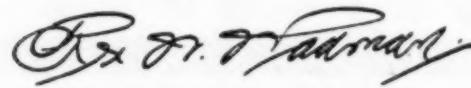
And here's another phase of the miracle that went hand-in-hand with these and the myriad of intertwined technological advances—ranging from the radio telephone and Bakelite to the X-ray tube and teletype . . . and to atomic energy and its untold potentialities.

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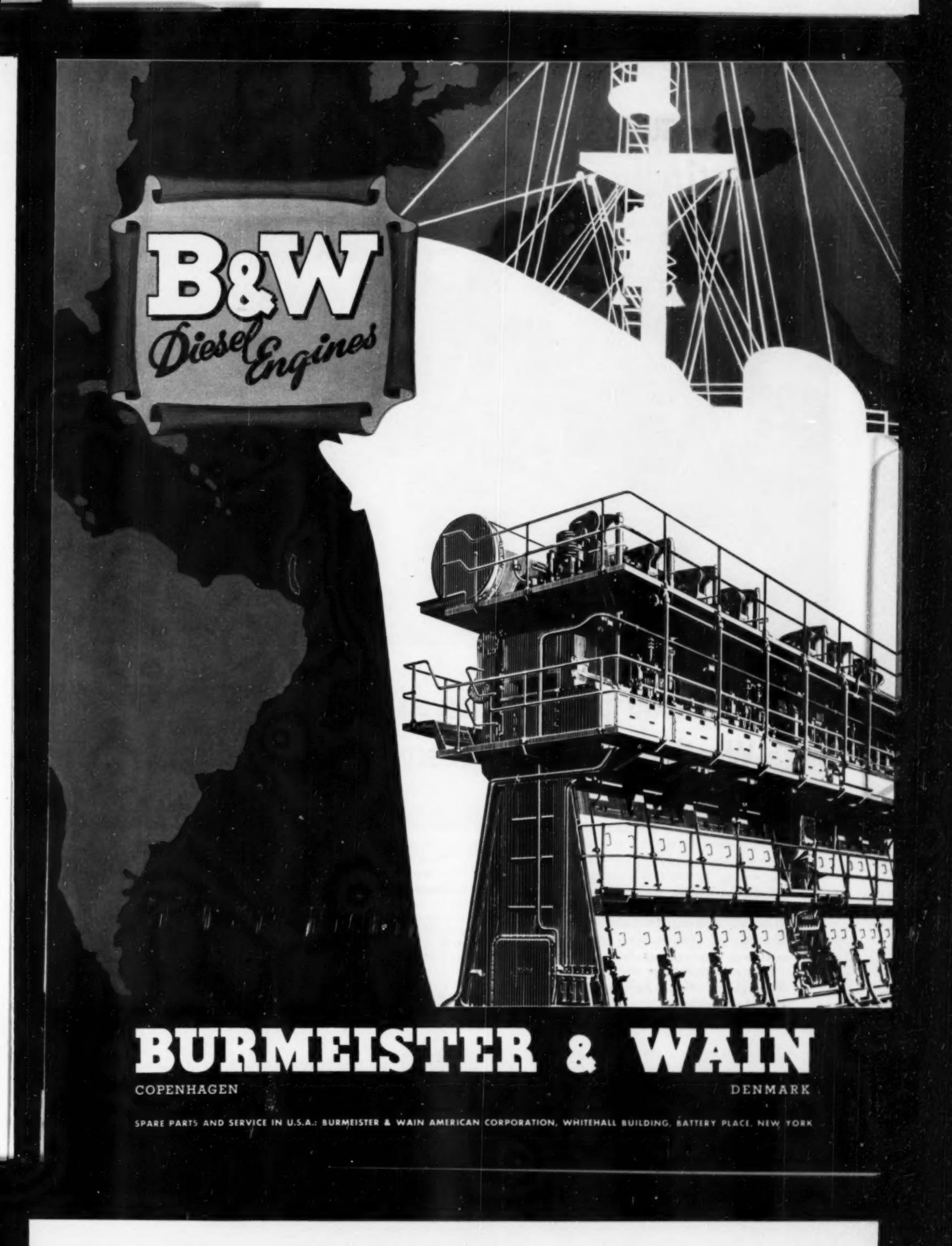
How did we do it? The basic cause for this composite miracle has been the release of human energy through FREEDOM, COMPETITION and OPPORTUNITY. And one of the most important results is the fact that more people are able to enjoy the products of this free energy than in any other system the world has ever known.

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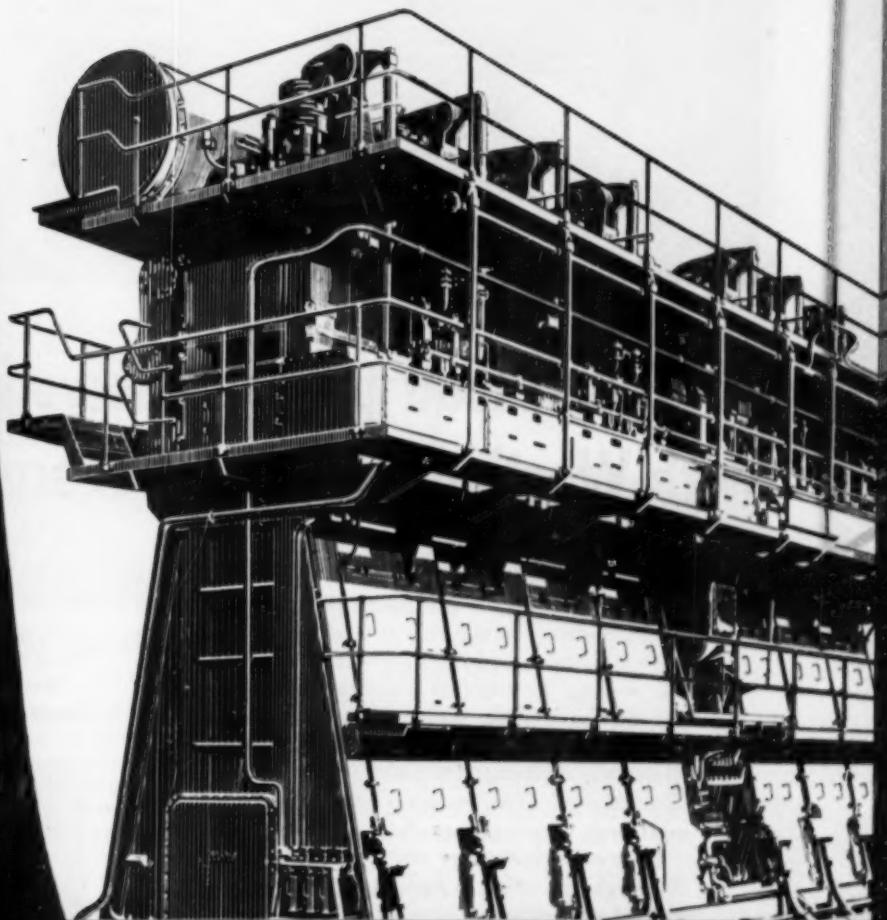
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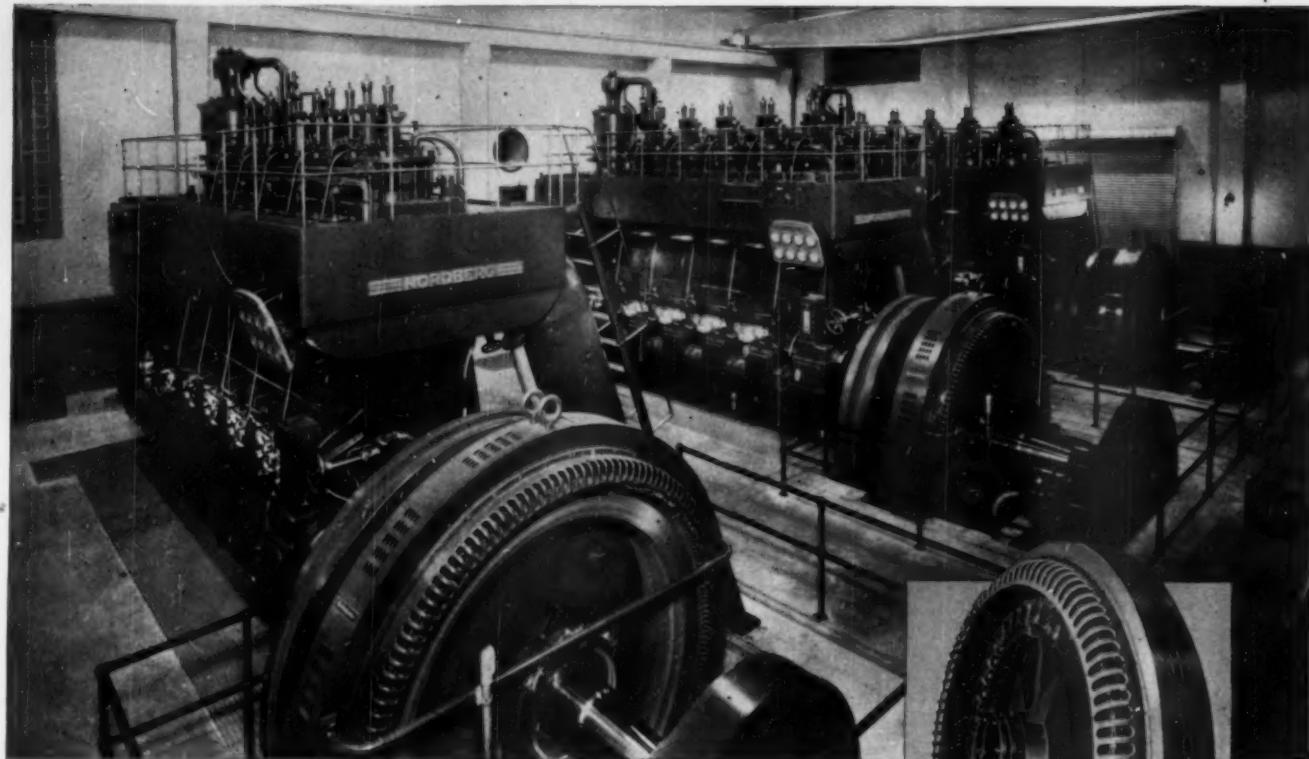
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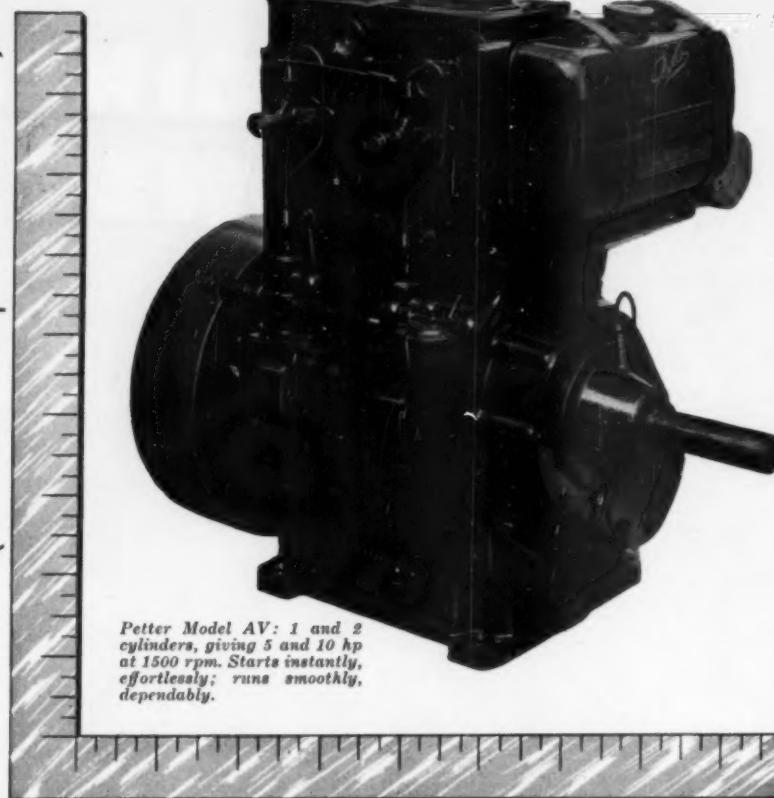
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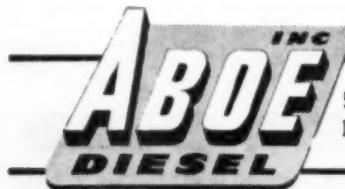
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## CONTENTS FOR AUGUST, 1950

New Diesel Ferry for Michigan	33
Diesel Trucks Galore	36
20 Years Tractor Farming	38
New G-M Detroit Diesel	40
Three New Ones for G.N.R.	42
Diesel Miner Sticks Its Neck Out!	44
Pipeline Needs Tough Machines	46
Texaco Combustion Process	50
Diesel Lightship Without a Crew	55
Star Angler	56
Lima-Hamilton Locomotive	57
Key West Gets Fresh Water Supply	58
Aluminum Alloy Bearings in Diesel Engines	60
Exchange Your Diesel Maintenance Ideas	62
High-Speed Diesels . . . Design, Operation and Maintenance	64
Supervising and Operating Engineers Section	66
What's Going On in England	67
Diesel-Driven Ski Lifts	68

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(Above) The towboat Freedom, owned and operated by the Keystone Division, Dravo Corporation. (Right) The Gulf Lubrication Engineer, shown with the Chief Engineer, checks on the performance of Gulf Dieselmotive Oil in her two V-type 500 hp Diesel engines.



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# NEW DIESEL FERRY FOR MICHIGAN

**The Traditional Great Lakes Steam Powered  
Habit Broken by the New Ferry for Mackinaw City**

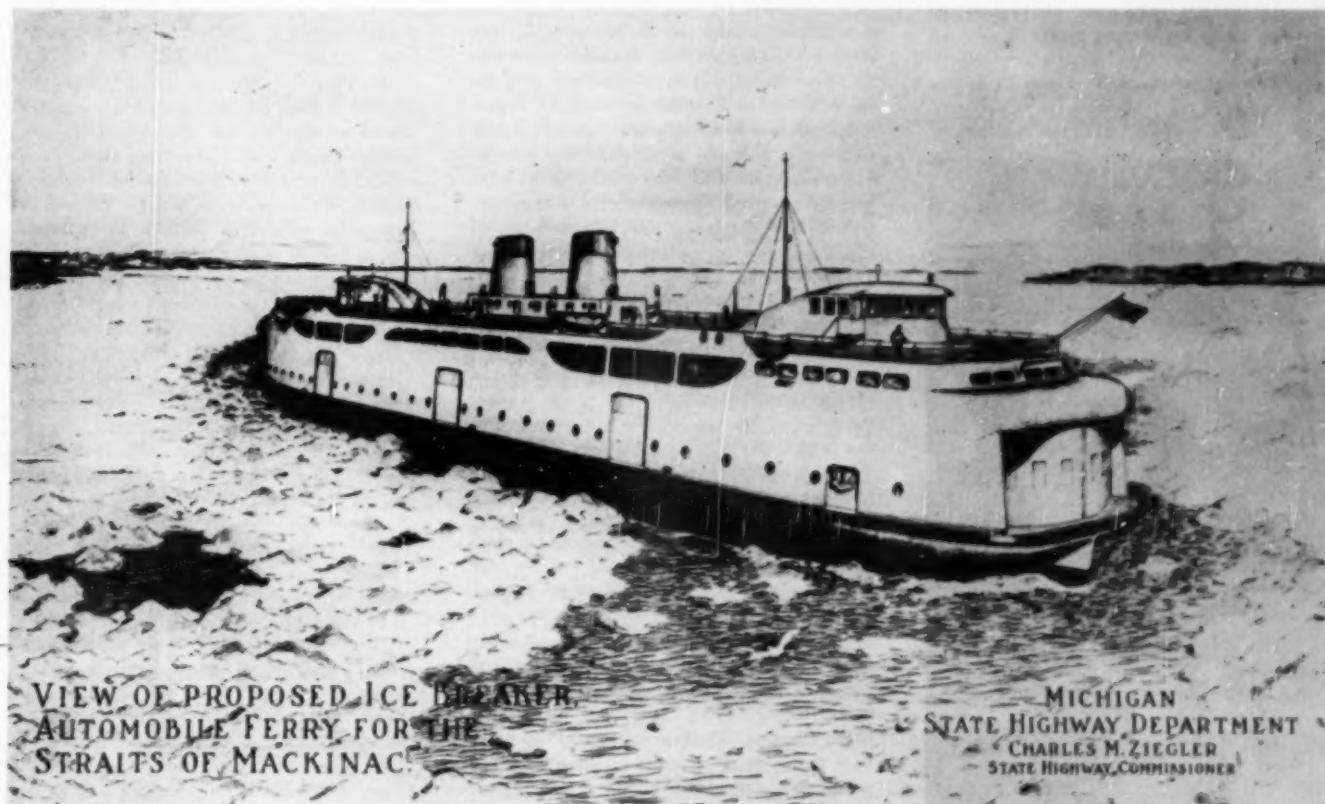
By WILL H. FULLERTON

THE diesel-powered double-ended ice breaking automobile ferry which is now being built for the Michigan State Highway Department by the Great Lakes Engineering Works, River Rouge, Michigan, will relieve a severe traffic bottleneck in the Great Lakes area. This ferry has been a major objective of State Highway Commissioner Charles M. Ziegler for several years. Back in 1923 the Michigan Highway Department, through an Act of the State Legislature, initiated an automobile ferry service linking state highways of the Upper and Lower Peninsulas of Michigan between St. Ignace and Mackinaw City by a 7-mile direct water route across the Straits of Mackinac. The Highway Department started this service on July 31, 1923, with the small wooden steam ferry *Ariel*, which was purchased for \$10,000 and remodeled at a cost of \$9,000. Capable of carrying but 20 vehicles per trip, the *Ariel* carried a total of 10,351 vehicles in the five months of operation

during the first year. The immediate popularity of this State Highway Department Ferry Service indicated the need for greater capacity and two additional ferry boats were purchased from the U. S. Government, which had used them for port service on the Atlantic Seaboard during World War I. Renamed the *St. Ignace* and *Mackinaw City*, these two steam ferries were continued in service until 1940, when they were returned to government service through sale to the War Department. The *Ariel* proved unsuited to the rough weather of the Straits and after a few years was taken out of service.

The consistently rapid growth of the cross-Straits traffic necessitated further enlargements of the ferry fleet. In 1928 the *Straits of Mackinac* was put into service and that year the number of vehicles carried by the service passed 100,000. By 1936 over 200,000 vehicles were being carried

across the Straits and that winter the ice breaker *Sainte Marie* was chartered from the Mackinaw Transportation Company and year round service was initiated. The *Sainte Marie*, up to the present time, is the only vessel available to the highway ferry fleet equipped for ice breaking. The rest of the fleet has been tied up from December 15 to about April 15 each year. However, when the *Sainte Marie* is out of commission temporarily for any reason, the *Chief Wawatam*, also owned by the Mackinaw Transportation Company, is available subject to priority of railroad requirements. The *Chief* is also used to augment the fleet during peak periods around July 4, Labor Day, and the deer hunting season. Two converted Great Lakes car ferries, now the *City of Cheboygan* and the *City of Munising*, with a total capacity of 203 cars, were added to the fleet in 1937, when traffic reached 274,000 vehicles. Three years later another car ferry, now the *City of Petosky*, was pur-



chased, reconstructed and added to the fleet, and in 1941, the last pre-war year, traffic reached nearly 375,000 vehicles. Along with the present fleet, suitable dock facilities at Mackinaw City and St. Ignace were developed. These, with the four ferries, represent a capital outlay of over \$2,500,000.

Cutting fares by 50 per cent in 1933, initiating expensive winter service in 1936 and expenditures for boats and docks cause the Ferry Service to lose money each year since 1937. Deficits were made up by transfers from the State Highway Fund. Travel restrictions during war years caused a drop in ferry traffic to 105,000 vehicles, but following the war the service rapidly increased in popularity. During 1947, 501,109 vehicles and 1,396,487 persons were carried. In 1949 vehicular traffic had increased to approximately 606,000 cars and trucks. Besides a steady rapid annual growth, holiday and hunting season traffic peaks have also caused problems for the State Ferry Service. On July 2, 1949, the service set a single day record of 6,068 cars handled.

As early as 1946 it was recognized that additional ferry service was needed and that the next vessel added to the fleet should have ice-breaking facilities. Plans and studies were started in 1947 for such a vessel and after rather extensive and detailed study of all factors involved, bids were received in October, 1949, on three alternate types of propulsion—oil-fired steam Uniflow, diesel-electric, and diesel direct drive with electric couplings. The contract for the new diesel direct drive powered ice breaking ferry was awarded to Great Lakes Engineering Works on the basis of its alternate bid of \$4,314,000 against its bid of \$3,972,000 for the steam Uniflow. The lowest diesel electric bid was \$4,557,000. The vessel was designed by the Great Lakes Engineering Works to meet requirements established by the Highway Department. This company has acted as both shipbuilder and designer for the department throughout most of the period since ferry service was initiated. It

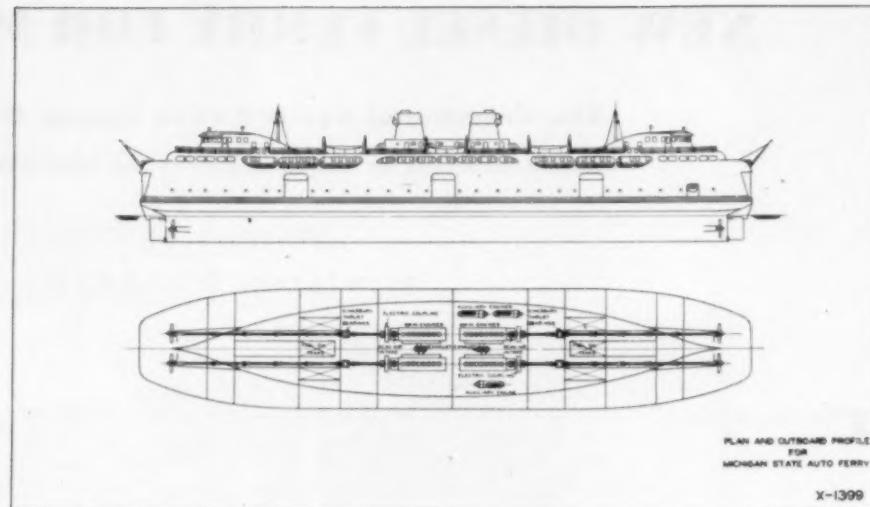
**Charles M. Ziegler, Michigan State Highway Commissioner.**



had previously built one of the ferries now in operation and has fitted and modified others of the fleet which were previously railroad and car ferries before their purchase by the Highway Department for this automobile traffic service. The new ship will be a steel, double-ended craft with twin screws at each end, strengthened for ice. Length overall will be 360 feet, molded beam 73 feet, 6 inches, and depth to the spar deck 43 feet, 4 inches. It will be built under special survey of the American Bureau of Shipping for the ice-breaking service on the Great Lakes that was previously furnished by the railroad car ferry and more recently assisted by the U. S. Coast Guard ice breaker, *Mackinaw*.

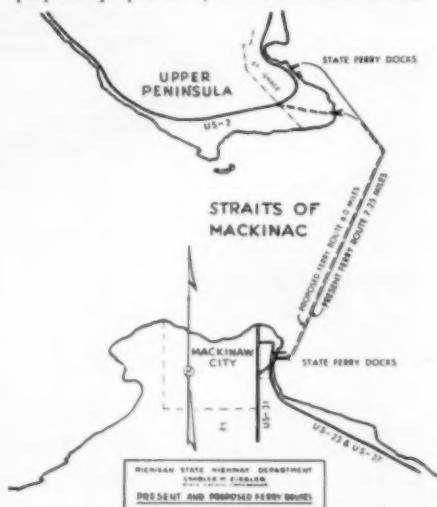
A hull form suitable for navigation in ice was adopted. Sections are well rounded and water-lines show few parallel areas. Scantlings are extra heavy in order to withstand the shock and impact of operation in heavy ice. Heavy panting frames are fitted at each end of the ship. The total installed maximum shaft horsepower will be 9,300. This will be equally divided between the four propellers. It is anticipated that full power on all screws will only be used in the most severe ice conditions. For other open water service schedules can be maintained with reduced power, using two engines each way. Professor Louis A. Baier, Chairman of the Department of Naval Architecture and Marine Engineering, University of Michigan, was retained as owner's consultant in the design of the ship and selection of its propulsion system. Model tests of the vessel will be conducted by Professor Baier in the University of Michigan testing tank, the wheels of his design.

Factors which influenced the decision to use direct diesel drive propulsion were more complex than those commonly encountered in marine practice. A dual purpose ship was required. It was to be fitted with high power for ice breaking, yet it had to be economically operated in open water with but a fraction of its total installed power. The vessel is double-ended, permitting operation in either direction. There were other service conditions governing design of the ship and its propelling machinery. It would be underway in open



water for very short runs. A large portion of the scheduled time for each trip would be taken up by loading, unloading, or maneuvering in and out of slips. The propulsion machinery would have to be extremely flexible in order to adjust the operating schedule to fluctuating traffic loads. Summer week end and holiday traffic is extremely heavy. Service at such times must be faster than it is on week days when the burden is comparatively light. Above all else, a vessel was desired that would satisfy these requirements at minimum annual expense for operation and fixed charges. In this respect the diesel direct drive showed decided advantages over other propulsion systems submitted for the new ferry.

A detailed schedule of operation for the proposed ship, based on an extensive traffic survey, was supplied to the Great Lakes Engineering Works. This outlined various seasonal operating conditions, number of trips per day, ship speeds, lay time, auxiliary electric load, and heating loads. There was also included information showing anticipated traffic to be handled by the ship for different periods in the year. With the basic design of the ship completed, relative operating costs of three proposed propulsion systems were calculated on



the basis of the Highway Department's operating schedule. These operating costs were predicated on guaranteed fuel and lube oil consumptions, anticipated maintenance, fixed costs and charges, and operating personnel. Professor Baier, after weighing and evaluating these factors in the light of his extensive marine experience, said: "The conclusions from the detailed studies which I made of the operating cost for the vessel indicate a substantial saving for direct diesel drive as compared to reciprocating steam propulsion and diesel-electric drive. This annual saving through the use of direct diesel drive, including insurance and depreciation, will in less than seven years offset the lower initial cost of the steam propulsion system—the initial cost of the diesel-electric drive being higher than the diesel direct drive."

Propulsion engines finally selected for the new ferry were four Nordberg direct-reversible marine diesels. They are 8-cylinder units of 21½-inch bore by 31-inch stroke. Each of these engines develops 2,360 bhp. at 165 rpm. Of the 2-cycle, port scavenging, solid-injection type, they will be fitted with attached engine-driven scavenging blowers. Each engine will drive a single propeller through an electric coupling. The electric couplings on each propeller shaft provide a number of operating features particularly desirable in ferry service. They act as clutches, permitting each individual engine to be disconnected from its propeller shaft. This facilitates maneuvering and allows forward screws to windmill when the vessel is being propelled by two after screws with the forward engines dead. When the vessel is working in heavy ice, they prevent transmission of shock torques from propellers through lineshafts to engines. They also help to contain torsional vibration criticals of the propulsion system within reasonable limits. Considerable speed reduction, as in dead slow operation with low power input, can be obtained by slipping the couplings. With propulsion engines working at 100 rpm., the propeller speed can be varied between 20 and 100 rpm. as desired. The couplings also allow application of almost instantaneous high torque, which might be required when attempting to free a jammed or frozen propeller.

The coupling has an inner squirrel-cage member bolted to the crankshaft flange. An outer salient-pole field member is bolted to the propeller shaft flange. There is no physical connection between these two elements. Torque is transmitted across the ¼-inch radial air gap between the inner and outer members by means of magnetic flux. Field current is supplied to the outer member through slip rings from 125-volt dc. generator sets. The coupling operates in a manner similar to that of a squirrel-cage induction motor. Torque transmitted varies as the relative slip between the inner and outer members. Normal slip at full torque is 1.6 per cent and each coupling requires approximately 26 kw. of excitation. Control of the propulsion engines is effected from two central control stands. One stand in the after engine room controls the two engines at that end of the ship and their electric couplings. The other stand in the forward engine room controls the two bow engines and their couplings. Operating signals

are transmitted from both pilot houses to control stands by conventional engine room telegraphs. It is interesting to note that although this is a double ended vessel, one end is arbitrarily designated the bow and the other the stern. These are clearly marked by label plates at strategic points throughout the ship.

All engine room auxiliaries and deck machinery will be driven by electric motors. Current for auxiliary power and services will be supplied by three Nordberg engine-driven generating sets. Engines for these sets will be of the 4-cycle supercharged type. They will be 7-cylinder units, each rated at 560 bhp. at 720 rpm. Cylinders will be 9-inch bore by 11½-inch stroke. Each engine will be directly connected to a 385-kw., 230-volt, 3-phase, 60-cycle generator with direct-connected exciter. Individual lube oil sumps, pumps, coolers, strainers and filters will be provided for each of the four propulsion diesel engines. Two jacket water cooling systems will be provided, one for each pair of propelling engines. One jacket and one lake water pump will be mounted on a sub-base with a common driving motor. There will be three such sets provided, two as main units, with the third as a standby. The lake water suction will normally be taken from a system composed of 12 connections spaced along bottom of the ship. Each of these will be provided with a steam thawing connection. In the event they should become plugged with ice, the space between the ship's shell and tank top under the engine rooms may be used for recirculative cooling of lake water for use in the heat exchangers for jacket water and lubricating oil. Jacket water from auxiliary engines in use is circulated through the two main engines that are stopped. These two stopped main engines thus act in effect as radiators, cooling the jacket water and keeping the main engines warm for future use. Circulation of the auxiliary engine jacket water to either pair of stopped main engines is manually controlled by valves in the piping, which includes all three auxiliary and the four main engines in a circuit. Both lubricating and fuel oil systems will be provided with necessary centrifuges, heaters, strainers and filters. A 250 psi. starting-air system with motor-driven compressors and suitable receivers will be installed.

Final plans for the new ferry show a vessel designed for the carriage of about 133 automobiles and 650 passengers. It is of steel construction throughout, with 12 transverse water-tight bulkheads. These will be spaced so that the vessel will not sink or capsize with any two compartments flooded. Shell plating seams and butts will be welded. Frames will be connected to shell plating by rivets. The shell will be bowed out around propeller shafts where these extend outboard of the hull. The sewage disposal system of the vessel provides for chlorination of effluent and steam heat sterilization of solids. Soil mains of the ship discharge into either of two valved raw sewage tanks selected for use by the operating engineer. The effluent overflows from the raw sewage tank automatically operated and controlled for predetermined periods of chlorination circulation

and disposal. Solids remaining in the raw sewage tank in use are steam heated to 160°F. while being recirculated and then pumped overboard in midstream. Periods of recirculation, frequency of disposal and alternation of the two raw sewage tanks are manually controlled. Passenger accommodations and observation rooms will be provided in a steel house above the car deck. On the deck over this house will be pilot houses and berthing accommodations for the crew. Two stacks will contain mufflers and air intake arrangements for the engines.

The operating schedule of this vessel as established by the Highway Department calls for a wide range of power and speed. Mid-week operation in the summer season will be maintained with two engines delivering a total of 2,060 shp. For weekends, holidays and the hunting season, a total of 4,120 shp. will be required from two engines. Under extreme ice conditions, the total of 9,300 shp. on all four screws may be needed. To satisfactorily handle the large diesel ice-breaker ferry now under contract, as well as the present end-loading boats, a new end loading dock will be constructed at both St. Ignace and Mackinaw City. The dock on the Northern peninsula will be constructed about 1½ miles south of the present docks in St. Ignace and will shorten the route from 7½ miles to 6 miles. This will cut down travel time but still provide protected docking facilities inside of Point St. Ignace and open up traffic in the town. The new diesel ferry represents the latest step taken by the Michigan State Highway Department to constantly improve communication between the Upper and Lower Michigan Peninsulas. This vital link is an incalculable boon to thousands of vacationists and travellers in this recreation area of the United States who enjoy the relaxation of a water trip.

G. M. Foster, bridge engineer of Michigan State Highway Department.





West Coast Fast Freight, Inc.'s, Kenworth truck with Buda diesel.

## DIESEL TRUCKS GALORE

**Five Widely Different Applications  
of Diesel Trucks Now So Extensively  
Used Throughout the Country.**

Houck Transport Co., Billings, Mont., Interna-  
tional Harvester tractor-truck with Buda diesel.

T. J. Carter, Fleet Supt., Interstate Motor Lines, and  
son standing on Buda diesel powered Kenworth.





A supercharged Buda diesel powers this Kenworth truck operated by Interstate Motor Lines out of Salt Lake City.



A Sterling Buda powered truck-tractor hauling a Lorain diesel shovel in Pittsburgh area.

37





GMC diesel truck (one of 5 like this) hauling 24-ton load of rice from Codora, California, drier to Rice Growers Association of California mill at Sacramento. One of some 30 modern dryer-bin-warehouse plants that handle the Sacramento Valley rice for the grower. It permits direct combing of rice with short harvest seasons, high quality product and big advance in rice farming.

## 20 YEARS TRACTOR FARMING

**Boeger Boys Started with Cletrac Gas Power in  
1930 for Orchard Work; Switched to Diesels in  
1937 for Rice, Prunes and Beef Cattle; Six Units**

**On Job Make Big Cuts in Costs.**

*By F. HAL HIGGINS*

THE Boeger Brothers—August and "Ed"—have been doing some ingenious mechanized farming up in Butte County to attract the writer's eye every time he drives up the Sacramento Valley to see what is doing that is new. The boys are "typical California ranchers" in that they are able to solve their problems as they come up by inventing or adapting new or old machines when they can't buy a machine already built to do the job. August Boeger started as a Cletrac dealer—fruit farmer back in 1930, when he got out of the university. "I learned enough about the Cletrac and its Hercules engine to service and keep it working," replied August when seen on his ranch above Gridley and almost within sight of the United States DA Rice Station at Biggs. "Naturally, by the time I learned all about this line of

tractors, I figured I might as well take on the dealership. So, I have farmed and acted as dealer on the Cletrac that finally became the Oliver in recent years. It has helped both our farming and the fitting of the Oliver line into Sacramento Valley farming where it had never made much headway in earlier years though quite popular in smaller farming areas in Coastal and Southern California." Here is what the Boeger brothers are farming this year: 1,500 acres in farming operations; 1,600 acres in rice, which is 20 per cent off from last year's record crop; 300 to 400 acres in summer fallow; 40 acres in ladino clover; 40 acres of kafir corn.

To show the swing to post-war deflation of the cash crops and the trend to more grass crops to

rebuild the war spewed soils, the Boegers have 150 beef cattle. The tractors the Boegers have bought, rebuilt and used, as recalled by the brothers, start with the comparative little gas crawler of 1930, which put in fine service in getting the orchard and field crop work done from its start in 1930 to the arrival of the first Cletrac diesels with Hercules engines in 1937.

That first Cletrac 30 diesel is still on the ranch as a stand-by engine in case of emergency in a heavy crop season, says Boeger. It was used steadily for eight years on the ranch. "We next bought a bargain diesel from Zumwalt, Cat-Deere dealer at Colusa. This was a Cletrac that had been through a fire and would have been junked in ordinary times. By purchase of a few parts and

careful rebuilding it was o.k. and has done as good a job farming as any. That was in 1940, when World War II was already under way for Europe and demand for tractors and farm machines was stepping up. By 1943, war was on in full blast and diesel tractors were worth their weight in gold. The diesel crawlers by this date were doing herculean work at plowing, disking, shaking prune trees, levelling land, etc.

"We started in rice farming and kept at it through war and up to this time. With about \$100,000 tied up in rice equipment, including pot-hole drier, combines, diesel tractors, etc., we expect to stay with rice as our main crop. The line-up of our diesels as we go into the 1950 crops are: 6 diesels each with Hercules XFE engine in it; one Allis-Chalmers HD10 with G.M. diesel engine. The reason for the off-line diesel is that it was war surplus and we could get it at a bargain when we couldn't get anything else. Two of the Cletracs (Olivers now) are the new type FDE models, made during and after the recent war. What does a diesel tractor mean in farming? The writer knew from his years with Caterpillar and contacts with International, Allis-Chalmers, Cummins, Buda, Waukesha, G.M., Fairbanks-Morse, Deere, Massey-Harris, White, Mack, Enterprise, Union, Atlas, P. & H., Sheppard and Cooper-Bessemer in logging, transportation, road building and farming what a lift had been given the buyers of both portable and stationary power. Agriculture on the West Coast, where the diesel has become standard equipment for the farmer and rancher, has had its greatest advance in the history of cultivated food production. The university-educated Boegers know and appreciate this. Said the younger brother: "It takes but half as much fuel in a diesel as we used in a gasoline tractor. The fuel costs but half as much as gasoline, roughly, as we get it for 11 cents now where we used to get it for 7 cents. Our fuel bill is down to 25 per cent for diesels compared to the pre-diesel days of tractor farming. When you look back at those old crawlers and the fuel, greases and oils they used, you can see what a load that change took off the farmer's back."



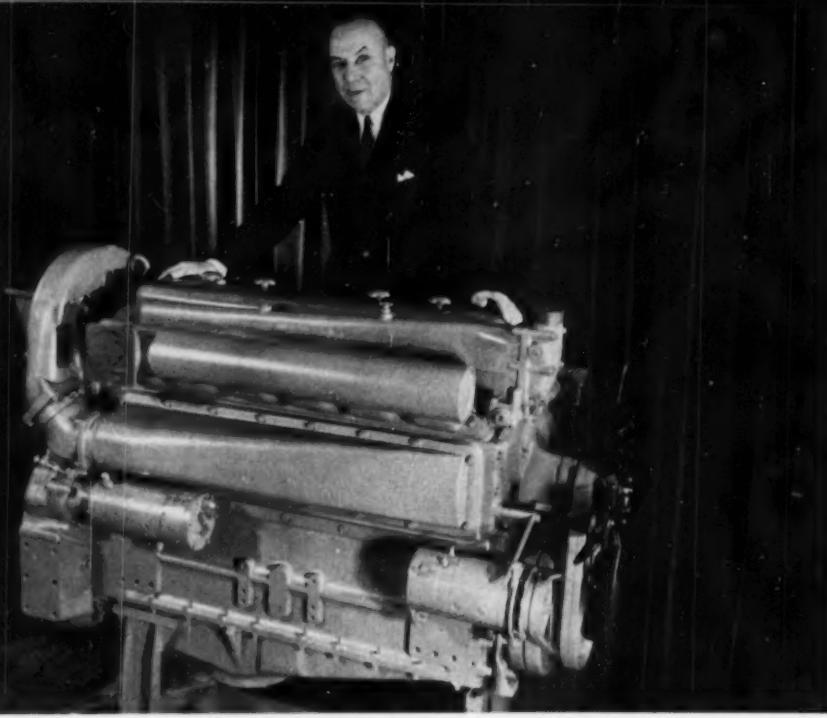
Boeger's diesel Cletrac rigged up to shake prunes off the trees at harvest time saves a lot of time and labor, but Boeger has still more ambitious plans for his diesels at prune harvest time. He plans to rig them up to shake the trees and catch the falling fruit on sheet metal wings on the tractor to roll them into boxes to eliminate picking up off the ground.

W. C. Railing, general contractor, specializes on asphalt pavements, crushed rock sand fill material. Here his Cat diesel grader is landscaping around the Bayless-Joost Rice Drier and Bins at Woodland, Calif., job that firm of contractors is putting up for a group of rice growers.



Celery has received a big step-up in California farming, fitting into rotations with sugar beets, lettuce, etc., to help balance the farming program under pressure by vitamin-hungry consumers. The tractor and motor truck fit into the transport scheme beautifully. One of the first Hercules diesel powered Cletracs in Boeger's territory.





W. T. Crowe, General Manager, Detroit Diesel Engine Division of General Motors and the company's new 6-110 diesel engine.

**A** NEW, compact, light weight diesel engine, now being manufactured by Detroit Diesel Engine Division of General Motors, promises the economy and efficiency of the diesel in scores of applications where such power could not be used before because of size and weight. The new engine, designated the "110" because of its 110 cubic inch displacement per cylinder, is a 6-cylinder 2-cycle unit rated at 275 horsepower. Developed through five years of research and testing, the "110" is built to meet the higher power requirements of large earth-moving vehicles, general industrial, oil field and marine equipment.

The engine made its debut in the recently introduced Budd diesel rail car, known as the "RDC," where its compact design permitted two power units with hydraulic drive to be mounted under the car floor. Two of these new GM diesel equipped RDC's went into service recently on the New York Central's Boston and Albany railroad, one has been delivered to the Western Pacific, three to the Chicago and Northwestern, and six more are on order by the Pennsylvania-Reading Railroad for operation out of Camden, N. J.

W. T. Crowe, general manager of Detroit Diesel Engine Division, reports that the engines in the first Budd RDC have performed brilliantly in more than 58,000 miles of successful demonstration runs. The engine has also undergone extensive testing in heavy off-the-highway vehicles and in U. S. Coast Guard vessels. "The new '110' engine," Mr. Crowe says, "embodies the same advanced principles of high-speed, two-cycle design as the 71 Series, of which more than 45,000,000 horsepower have been produced since 1937. Like the 71 engine, the new '110' combines the American diesel industry's highest power-per-pound ratio with smoothness and economy of operation and maintenance."

The horsepower rating of 275 at 1,800 rpm. is at-

tained with a bmeep. of 92 lbs. per square inch. Bore is 5 inches and stroke 5.6 inches. Features include blower scavenging with a new and highly efficient gear-driven centrifugal blower furnishing considerably more air for the cylinder than is needed for combustion. Location of the blower at the rear of the engine, above the flywheel, not only offers the best possible connection to the main gear train, but also contributes to compactness. The blower impeller is an aluminum alloy forging nine inches in diameter and is of the open type with radial vanes. A spiral air inlet helps maintain its high efficiency.

GM unit injectors (one for each cylinder) pump, meter and atomize the fuel, and are easily removed for inspection or exchange. Cylinder block and head are one-piece castings, both being symmetrical about a vertical plane between the No. 3 and 4 cylinders. This symmetry allows the cylinder head and block to be reversed, giving a choice of rotational directions and making possible a variety of accessory locations to suit installation requirements.

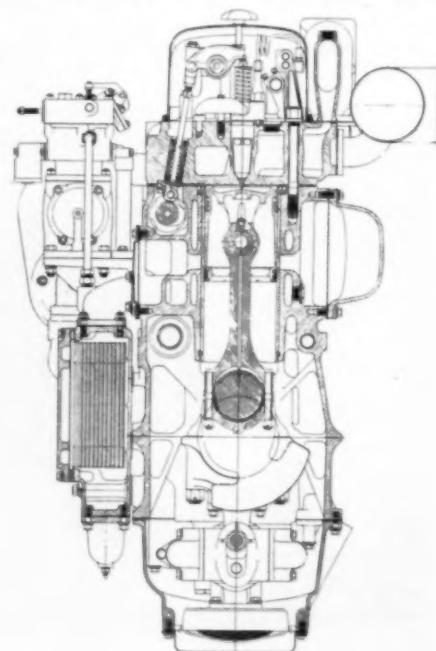
The engine is of rugged heavy-duty construction throughout. All wearing parts such as cylinder liners, bearings, valve guides and inserts are precision parts and are readily replaceable, which adds to engine life and to ease of repair. Large main bearing and crankpin journals assure long bearing life. As an example of the heavy-duty design employed, the seven main bearing crankshaft journals are of 4-inch diameter; the connecting rod journals  $3\frac{1}{2}$  inches. Use of a 1-5-3-4-2-6 firing order, together with 2-cycle operation, assures a smooth running, well-balanced engine. Only two small crankshaft counterweights are necessary, and these only to equalize bearing loads.

The customary forced feed lubrication is provided, with a gear-driven pump delivering 45 gallons per minute at 1,800 rpm. The oil gallery is a sep-

## A NEW AND LARGER G-M DETROIT DIESEL

By W. L. BODE

arate tube cast in the cylinder block, eliminating long hole drilling operations. Oil pans have removable bottom cleanout covers. Pistons are triple-cooled with water, oil and air. The "110" is offered (a) as a bare engine, (b) with full equipment for marine or industrial use, or (c) with special accessory arrangements for a variety of end products. Optional accessories, which may be powered directly from the gear train, include a hydraulic steering pump, an air compressor and a pump to circulate oil through a General Motors torque converter. The torque converter is designed specifically for the engine and installed as an integral unit at the factory for those applications where a fluid drive is advantageous. The



DIESEL PROGRESS

General Motors hydraulic reverse and reduction gear is also available for marine applications.

Industrial and marine sales and service of the new "110" engine will be handled in the United States by Detroit Diesel's 184 established distributors and dealers and in Canada by the distributors of General Motors of Canada, Ltd., Oshawa, Ontario. In all other countries, the "110" will be sold and serviced by distributors and dealers of General Motors Overseas Operations or by the Foreign Distributors Division of G.M.O.O.

All power ratings are based upon an air density corresponding to the standard barometer of 28.25 in. hg. at 1,500 feet altitude and an air temperature of 90°F. To allow for manufacturing tolerances, the rated power output whether maximum, normal or continuous is guaranteed within 5 per cent. The injectors will be adjusted to limit the power output of the engine to the normal or maximum intermittent rating as required.

**Continuous Rating**—is the power rating for engine applications where steady "hour in and hour out" operation is required with constant loads of long duration. These applications include generator sets, cotton gins, water pumps, etc.

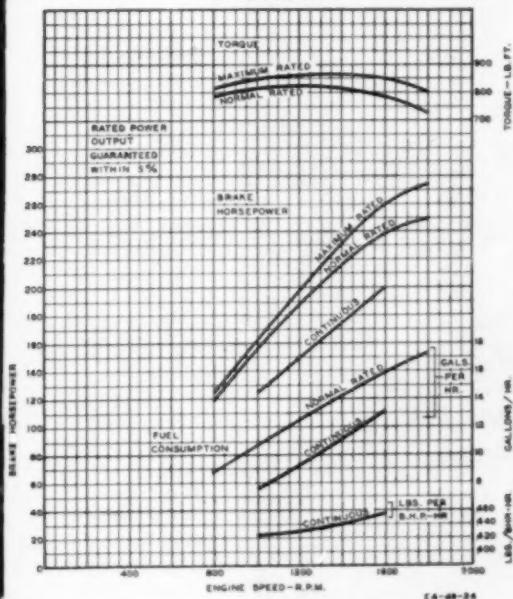
**Normal Intermittent Rating**—is the normal capacity available for intermittent use. This is for applications such as rock crushers, oil field rigs, marine work boat engines, etc.

**Maximum Intermittent Rating**—is an increased capacity for applications which require greater intermittent power. This increase in power is achieved by a factory adjustment of the injector fuel output. This power is available for intermittent duty—subject to factory approval—for such applications as trucks, excavators, marine pleasure craft, etc.



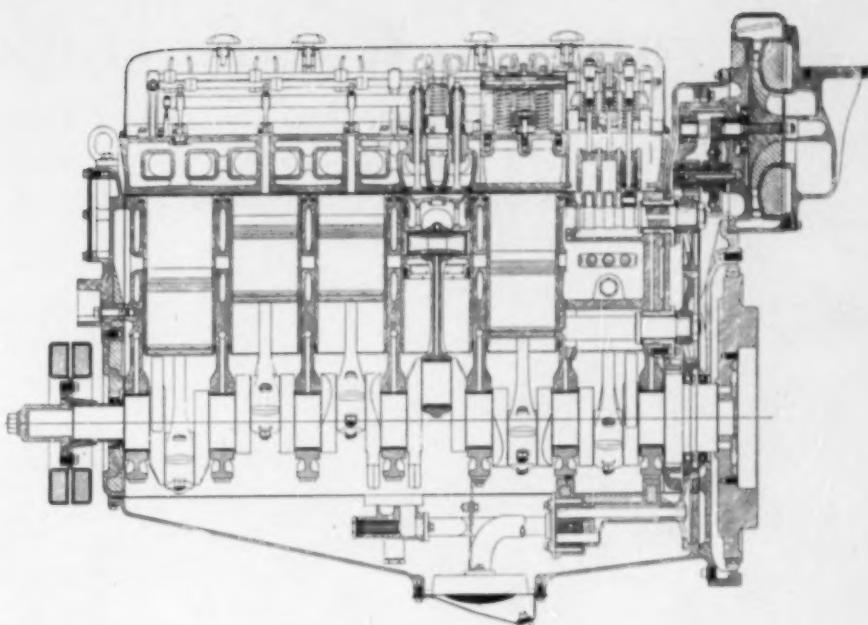
### DETROIT DIESEL ENGINE DIVISION GENERAL MOTORS CORPORATION

PERFORMANCE 6-110  
BASIC ENGINE



AUGUST 1950

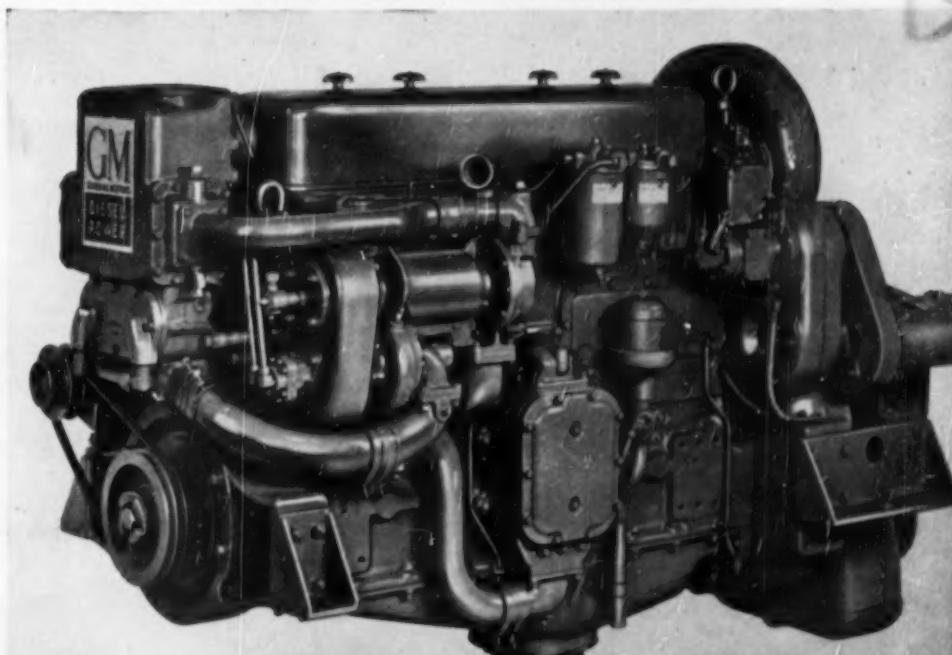
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### CONDENSED ENGINE SPECIFICATIONS

	Marine	Fan to Flywheel	Power Take-Off
Engine Model Number	62200 RA	62300 RA	62400 RA
Engine	2 cycle	2 cycle	2 cycle
Number of Cylinders	6	6	6
Bore and Stroke	5 x 5.6	5 x 5.6	5 x 5.6
Total Displacement	660 cu. in.	600 cu. in.	660 cu. in.
Maximum Rated BHP Basic Engine, 1800 RPM	275	275	275
Normal Rated BHP Basic Engine, 1800 RPM	250	250	250
Maximum Rated BHP with Standard Equipment, 1800 RPM	254	254	254
Normal Rated BHP with Standard Equipment, 1800 RPM	229	229	229
Continuous Rated BHP with Standard Equipment, 1600 RPM	186	186	186
BMEP, Continuous Rating, 1600 RPM	70	70	70
Maximum Torque, 1200 RPM	834 lbs. ft.	834 lbs. ft.	834 lbs. ft.
Rated BHP—Basic Engine			
Pleasure Craft, 1800 RPM	275		
Work Boats, 1800 RPM	250		

The new General Motors 6-110 marine diesel is available in a choice of rotational directions and with a variety of accessory locations.



## THREE NEW ONES FOR G.N.R.

**Late in June the Great Northern Railroad  
Placed Three New Diesel Driven Trains in  
Service Along Our Northern Border.**

**By DOUGLAS SHEARING**



THE Great Northern Railway recently placed into regular service three completely new streamliners on fast schedules after exhibition tours of their routes. Two, both christened the *International*, went on the 155-mile run between Seattle, Wash., and Vancouver, B. C. The third, the *Red River*, now operates on the 320-mile route between St. Paul-Minneapolis, Minn., and Grand Forks, N. D.

The five cars in each train were built by American Car and Foundry Company and the 2,000-hp. single unit diesel-electric locomotives were constructed by Electro-Motive Division of General Motors Corporation. The *Internationals* are the first modern streamliners placed in regular service into Canada. Each will complete one and one-half round trips daily, increasing departures from Seattle and Vancouver from two to three daily and reducing running time to 3 hours and 55 minutes—a slash of 35 minutes from present schedules. Each *International* has seating capacity of 180, not including room for 24 in the cafe. Each train has a mail-baggage car, two coaches, a cafe-coach and a parlor-lounge car.

The *Red River* likewise has a faster schedule than any other offered previously on this route. Departure from Grand Forks is now in the morning. Returning, the train leaves the Twin Cities in late afternoon. Time between Grand Forks and Minneapolis is 6 hours, with 30 minutes more for St. Paul. The *Red River* seats 200 passengers, not counting coffee shop and table dining space for 21. The five cars include a mail-baggage, three coaches and a cafe-parlor car.

Passenger-carrying cars have air conditioning equipment of the Frigidaire electro-mechanical type with an 8-ton unit. Trane Company evaporative condensers are located under the car. Conditioned air is forced through aluminum ducts and fed through Anemostat's and Pyle National Company's multi-vent air distribution panels where desired. The Frigidaire evaporator unit is located above the ceiling. Mail-baggage cars are not air conditioned, but suitable cooling fans are provided in the mail compartment.

Coaches are constructed with a main compartment approximately 53 feet in length, with a seating capacity of 60 persons utilizing Heywood-Wakefield's Sleepy Hollow type seats with rotating frames and reclining adjustable backs. The Sleepy Hollow seats have adjustable footrests, chrome plated kickplates and foam rubber-filled cushions and backs. Four of the seats on each side of each end are covered with Goodall Sanford Super Needlepoint of chamois color, while the remaining seats have a covering of Goodall Sanford Vel-point with a special design on a green background. The men's lounge is located at the vestibule end of the car and has two washstands, a dental bowl and a sofa upholstered in brown Tolex, a supported vinylite. Shaving mirrors and other conveniences are provided. The toilet is a single compartment with a door into the lounge. The women's lounge is located at the opposite end of the car and also has two wash basins and mirrors. Vanity tables, each with an individual mirror, have tan linen Formica tops and vanity chairs upholstered in a pastel rose leather.

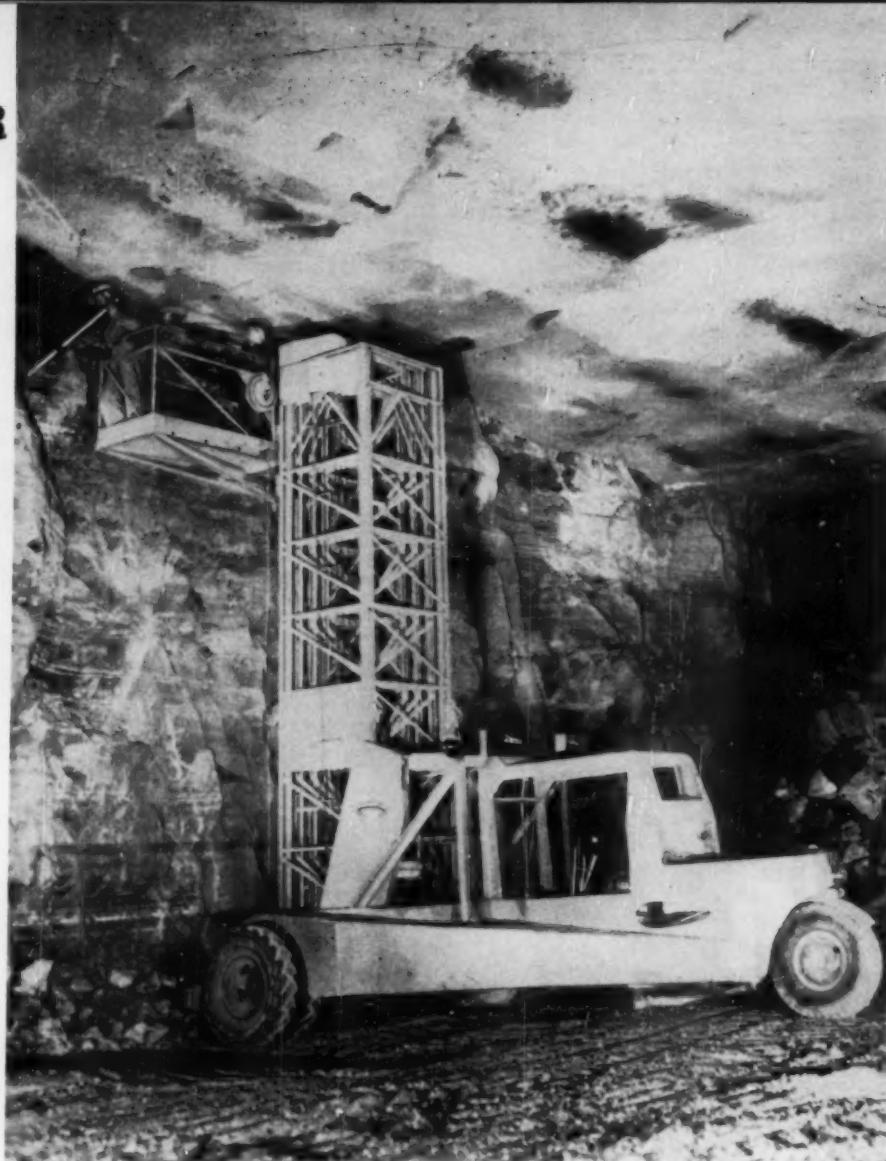


## DIESEL MINER STICKS ITS NECK OUT!

**Future Oil Supply in Sight**  
**From U.S. Bureau of Mines**  
**Oil Shale Demonstration**  
**Plant. Diesel Telescopic Lift**  
**Permits Easy Sealing of**  
**Headings and Walls.**

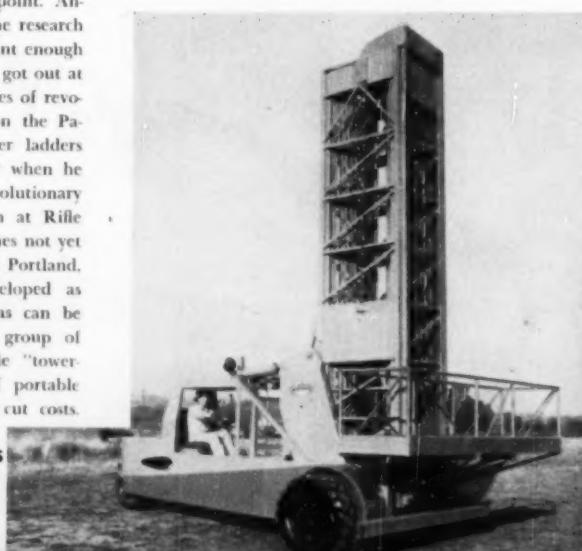
By F. HAL HIGGINS

TWO schools of thought are still battling for public attention on their theories as to how long the United States supply of oil will last to power our domestic and war machines that advance and maintain our American way of life. But old Uncle Sam some years ago decided to go ahead and assure this essential fuel for our future for a long, long time in spite of what may or may not be hidden in liquid form beneath the earth's crust. Your Old Reporter recalls being in Denver about four years ago when the Bureau of Mines of the U. S. Department of the Interior officially opened its oil-shale demonstration plant near Rifle, Colorado. The Denver newspapers and the high politicians of United States and state governments were throwing quite a party for the event. We recall glancing up from our *Denver Post* between breakfast grapefruit and bacon courses at the Brown Palace hotel to study the faces of the who's who of the event as they discussed the big event of that day. Time has marched on since that opening of the plant to demonstrate that oil could be processed from the shale rock running through great areas of the Rocky Mountain States. Just how far they have gone in working out processes that will make it possible for commercial oil producers to take over the idea and integrate it into the oil industry is not quite clear to the writer from this point. Another war would be certain to make the research and development work at Rifle important enough to enlarge. The oil is there and can be got out at a price now. But a couple of new pieces of revolutionary equipment that developed on the Pacific Coast to meet demands for fewer ladders came to the writer's attention recently when he was in Portland, Oregon. Such a revolutionary plant as this new oil-shale installation at Rifle was bound to call for some new machines not yet on the market. Fortunately, out at Portland, where the logging industry has developed as rugged and inventive a set of men as can be found on the face of the globe, a group of brothers has been developing portable "tower-mobile cranes" and a whole line of portable equipment to speed construction and cut costs.



These men are the Wagner brothers; hence, the name "Wagnermobile" as a trade handle on all the machines they turn out. The Wagners' "Towermobile" caught the attention of the engineers on the Bureau of Mines plant and they soon got around to ordering a couple of special jobs to reach into the air 62 feet. The unit is powered by two Hercules diesel engines, which seems to answer

the demands on the machine nicely. Listen to the sales manager, James J. Foreman, of Mixer-Mobile Distributors, Inc., describe the new machines he sent to Colorado for this special work: "We have only two of these diesel units in operation in the United States, and these were made special for the Department of the Interior, Bureau of Mines, at Rifle, Colorado. The unit is shown



in the illustration. This unit was equipped with a Hercules motor, and from what we can learn through the Bureau of Mines, both units that were manufactured for them are performing very satisfactorily. We have manufactured other units with diesel motors but these have been for export."

How these two machines work on their mining job is told in the following: "The new lift was built in response to the government's need for a mobile scaffold that would allow men to work at heretofore inaccessible high sections in the mine. Built on the well-known Wagnermobile tricycle chassis, the new piece of equipment has been designed for maneuverability when either raised to its full height of 62 feet or compactly folded down to a mere 12 feet 8 inches. The hoist while nested is only 20 feet in height and will extend to 62 feet. A safety feature of the lift is a remote control lever which enables workers to lower themselves as they work or in case of emergency. This unit has a powerful 92-hp. diesel engine and is hydraulically operated with the exception of the cables which lift and lower the hoist. The new unit has great possibilities for use in shale-rock



Photos by U. S. Bureau of Mines.



mining, shipyards and building projects, wherever mobile scaffolding is required. The new platform lift is ideal for boring and scaling down high ceilings and walls. It is also well designed for flood-light maintenance.

"The present system of mining consists of advancing a top level or advance heading 27 feet high by 60 feet wide," says Emery M. Sippelle, Chief, Oil-Shale Mine Branch, Bureau of Mines. "The advance of the top level is followed by two benches each 22 feet high. The over-burden is supported by 60-foot-square pillars left in a checkerboard pattern. The roof and pillars are 27 feet high as the top level is advanced; they increase to 49 feet high as the middle level advances and to 71 feet when the bottom level advances. The portable telescopic platform is so designed that it may be used for inspection of the roof and pillars and scaling off loose rock from any level of the proposed mine structure. Figure 1 shows the machine at work on the top level for scaling the 27-foot-high headings. Figure 2 shows it at work on the middle level in position to scale the 49-foot-high pillar walls. Figure 3 shows the tower fully extended to 65 feet for scaling the surface cliff face. The same position would be used in inspecting the roof and pillars of the bottom level where the roof would be 71 feet high."

# PIPELINE NEEDS TOUGH MACHINES— TOUGHER MEN!

By JAMES JOSEPH



Massed diesel equipment on main spread—here pipe is being asphalted and fiber-glass wrapped as side-boom tractors hold pipe suspended.

YOU'VE come 1,600 miles out of Texas, burying 650,000 tons of steel pipe behind you in one long, continuous grave. Ahead are big diesels—and plenty of them. Men of Spread One—who've nursed this line during four years of pipelaying, say if it weren't for the diesels they wouldn't be in the Arizona desert today—poised for the California border. For Spread One—the 350-man team which El Paso Natural Gas Company dispatched from Texas almost four years ago—the going has been tough. It's been equally hard on some 300 pieces of heavy duty equipment—a lot of it diesel—which has carried the line forward almost to California. It's one of the biggest (30-inch diameter), one of the longest (1,600 miles) gas pipelines in the United States—and one of the most rugged. At the California border it'll meet a 34-inch section which runs into the San Francisco Bay area.

Now Spread One is fighting desert heat, blasting winds up to 70 miles an hour, and heat that reaches 115° to 120°F.—“on a cool day.” To see diesel equipment and the men who run it in action, DIESEL PROGRESS visited the construction site as it moved forward a mile a day along a 60-foot wide right-of-way which bulldozers tore out of the country from Texas to the line's terminus. Back in Salome, Arizona—“where she danced”—El Paso set up shop, and as the line approached the town—driving through the Arizona deserts—they were prepared for the worst. Life of a diesel engine—or any other for that matter—is directly proportional to its air filters. Air filters are changed every day—on every rig. Lube oil is changed every 60 hours, which, considering the 10-hour working day, six days a week, means every sixth day. After every day's operations, rigs are greased. Oil filters are

changed at every oil drain. Fuel filters are cleaned or changed when they need it—about every four to five weeks. Many of the rigs never leave the field—which means that field maintenance shops, most of them portable, go right along with the equipment. Typical of mobile equipment is a gasoline-powered truck—with five grease tanks, feeding by reeled hose; a Kohler light plant for night operations; complete stocks of fuel and oil filters and air compressors.

Meanwhile, as his field crews spend most of the night greasing, changing oil and air filters, Van A. McDannell, master mechanic for Spread One, takes over equipment which has been hauled to the Salome shops. McDannell has devoted as much time keeping dirt and desert dust out of his engines—as repairing them. For instance, his shop

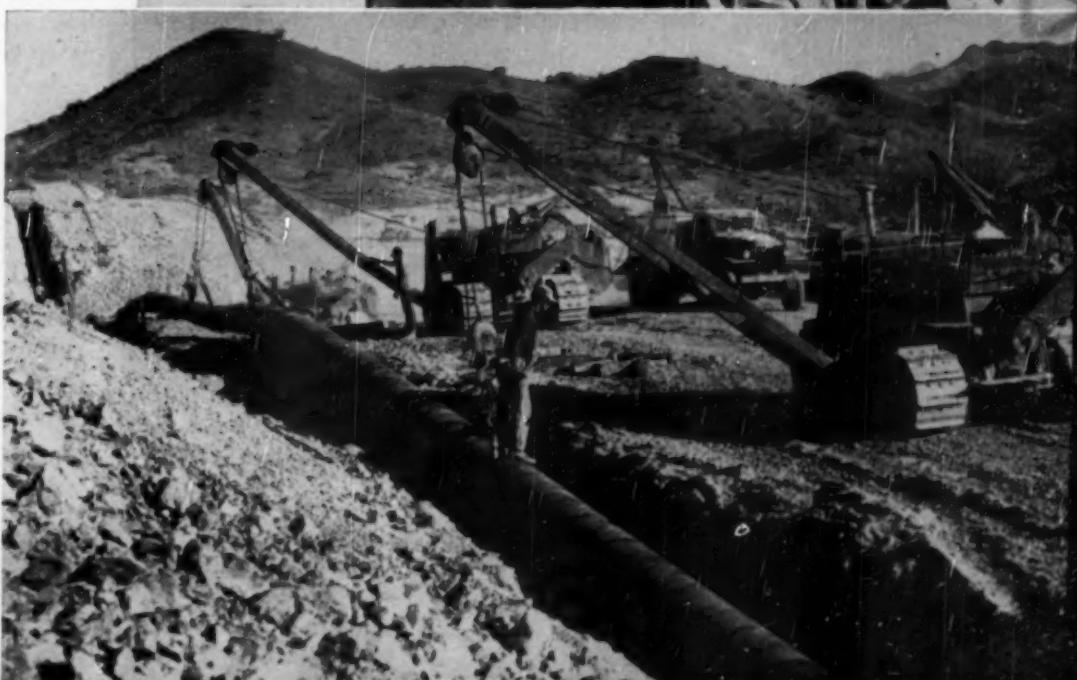
men build double manifolds out of blower heads, then mount an air cleaner on both sides. Typical is a series 671 GMC diesel, rated 200-hp., which has two newly installed RD-8 air cleaners. Usually all the shop has to do is replace the oil filter element during every oil change.

Oldtimers, who should know, say the Arizona desert has never seen such a mass of mechanization. To really appreciate a pipelaying job of this size, you have to start where the desert leaves off and Spread One begins—and work forward maybe 25 miles along the line—from crew to crew—from one piece of specialized diesel equipment to another. Pipeliners call their crews "spreads"—probably because crews are spread out about a day's work apart. Way up front—breaking a way through the desert—are the diesel-powered ditching machines. There are three of them, costing \$30,000 each, and powered by a Caterpillar 95-hp. at 850 rpm. diesel engine. On steep hills tractors act as brakes, paying out cable to hold the ditching machines from running away.

Behind the ditchers come wagon drill operators—punching blasting holes. Behind them, maybe two or three miles, are the blasters. From here, you drop back five more miles to where the main spread works. This includes bending the pipe to fit the terrain, welding it together, 60-foot sections at a time. Then the dope and wrapping machines, mounted on the pipe, swabbing it as it goes. And finally, the lowering-in crews—a day behind the dope teams. Following in the wake of this mechanized project are the shovel-bladed dozers, shoving desert sand and rock in over the 4-foot wide, 6-foot deep trench—burying the pipe behind the spread. Moving continuously along the 25-mile working area, stretched thinly along the 60-foot wide swath cut by dozers from Texas, are maintenance crews. There's a 4,000-gallon diesel tanker truck, watering the right-of-way to keep dust down. There's a 1,500-gallon capacity fuel rig—which brings out the approximately 800 gallons of diesel fuel which the equipment burns daily.

You've got to be young to handle a pipe-laying rig—and tough, too. Here a sideboom (diesel powered) operator talks over operations with boss James Lowry.

Laying-in operation . . . lowering pipe into trench with a mass of diesel equipment.

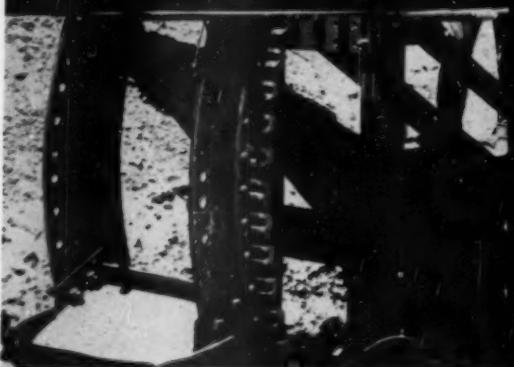
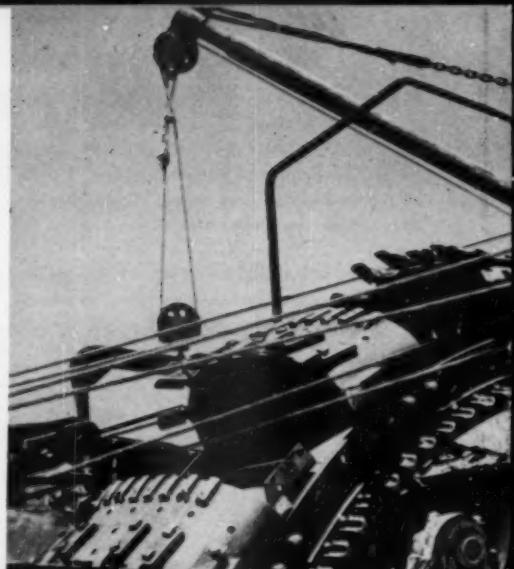


Presently working the line are some nine TD-18 International tractors, 84 drawbar power; eight sideboom tractors, TD-18; five Cletrac sideboom tractors, powered by Hercules 200-hp. diesel engines; a wide assortment of pipe-handling equipment, the tractors being the most useful. There are Caterpillars, both tow and sideboom tractors, D-7, and an Austin Western Maintainer grader, with a UD-14 International diesel engine.

For 30 miles north of the finished pipe, four 5-ton sections lie scattered, each 30 inches in diameter, and 60 feet long. These were high-balled from railheads, sometimes as far as 75-80 miles over the right-of-way, by diesel truck. Assistant Superintendent of Spread One, Jim Lowry, started out with the line when it left Texas four years ago. He, like about half of his crew, has stuck with it ever since. And they've worn out plenty of equipment along the way. "I've been pipelaying for a lot of years," says Lowry—who is a veteran pipeline boss, although he's only 30—"but this is as rough country as I've ever pushed a line through." Then he

retracts his statements a bit. "Well, the roughest next to the wartime Canol project in northern Canada—there just wasn't anything rougher than a Canadian winter aboard a diesel tractor. It isn't how much diesel equipment you've got—although we've got plenty—it's how you coordinate it on your line," says Lowry, who jeeps over 200 miles a day makes the complete circuit from beginning to end.

In pipelining the breakdown of one crew can stop work along a 25-mile front. And when you're moving a mile—or perhaps two miles a day—no slip-ups can be tolerated. That's the reason that a parts supply van—a converted army supply van and tractor to pull it—move right along with the spread. Three more supply trucks work from this van, carrying on-the-job mechanics to repairs along the line. Ten trucks and jeeps are radio equipped, with a main radio centered in the parts supply van. This radio relays field calls to more distant (up to 75 or 80 miles) town headquarters—where the central garage and repair depot is. The main-



Diesel-powered shovel at work over trench as James Lowry, boss of Spread One, checks operation.

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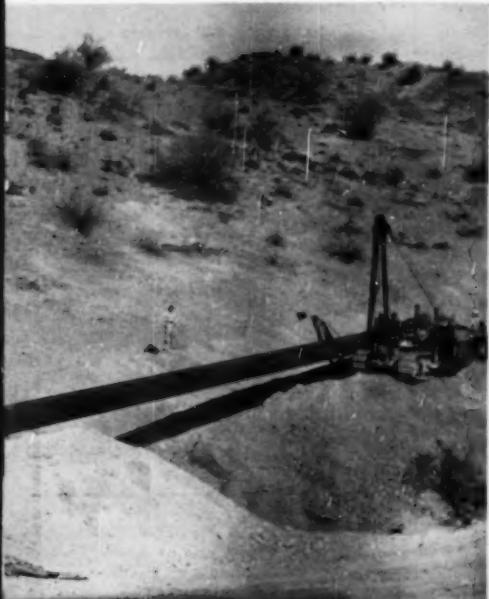
tenance shops work 16 hours a day—sometimes 24. To complicate maintenance jobs are long desert stretches. The way it works out of Salome is typical. It's about 130 miles from Salome, across the desert, to the next town. The pipe is being laid between, through a wide sweep of desert where Patton trained his desert tank crews. That's something else diesel tractor operators have to watch—dud shells. A big sign warning, "ABANDONED



Big ditching machine—diesel powered.

RANGE—"leave unfamiliar objects alone," is good advice. But in the desert that applies to snakes, too.

On a job where distances are 130 miles between towns, it's obvious that one maintenance station can't handle all the problems. Thus, as the spread moves out of one town, an auxiliary shop is set up in the next. Some crew members work from one town, some from the other—depending where along



the 25-45 miles front you're working. The ditcher operators work from one town—since they're at the extreme front of the line. Dozer operators who cover the buried pipe—at the other extreme—work from another. That's the reason why greasing, oiling, and refueling crews often leave several days' supply with one end of the line or another. Crewmen might not see one another for as long as a week. Meanwhile, as the Arizona desert north of Salome becomes burial ground for the biggest gas pipeline in the United States, there are some bright spots. Some crewmen, self-appointed mineralogists, have been following behind the ditching machines and staking out claims. "Those big diesel ditchers," one spreadman said, "are regular mobile prospectors," and then he points to a pile of rock marking his silver claim.

But if it's been a rich strike for prospecting crewmen, it's been a bigger discovery for diesel repairmen on the job. "We've run into about every maintenance problem you can imagine—a lot of them varying with the country. And most of the rigs we've got have been with us all through the four years."

Sideboom diesel helps bend big pipe on the job.

# THE ELIMINATION OF COMBUSTION KNOCK- TEXACO COMBUSTION PROCESS

Presented at the Summer Meeting, SAE,  
June 4-9th, at French Lick Springs, Indiana

By E. M. BARBER\*, B. REYNOLDS† and W. T. TIERNEY\*

**R**ECIPROCATING internal-combustion engines and liquid petroleum fuels combine to form a power source that has had a tremendous impact on our civilization. The past and present uses of this power source have increased the productivity of our agriculture and industry; increased the capacity, range and speed of our transportation, made our warfare more destructive and even altered our daily personal habits and our way of living. It is characteristic of this source of power that its value depends directly on its ability to be used profitably by the greatest number of people to do the greatest number and variety of jobs. The statistics of the engine building and fuel supply industries show that increasing numbers of people wish to utilize this source of power to do more and more of their work.

As they are now constituted, the engines are rather selective in their fuel diet and they can use only a portion of the petroleum that potentially is available as liquid fuel. Furthermore, the efficiency with which the engines convert the heat energy of the fuel into mechanical energy is quite low, being about 10 per cent on the average when the engines are used at full load but only about 6 per cent at the mean load of normal use. It is not uncommon, during its useful life, for an engine to consume fuel costing 10 to 20 times the original price of the engine.

As a result of the importance of fuel utilization on the profitable use of this power source a very substantial portion of the industries' research and development efforts has been directed toward increasing the efficiency of the engines and toward simultaneous increases in the quality of the fuel and in the proportion of crude petroleum that can be made into fuel. These efforts have been relatively fruitful and over a 20 to 30 year period they have resulted, on the engine side, in some 20 per cent increase of efficiency which has been

\* The Texas Company, Beacon Laboratories, Beacon, N. Y.  
† Texaco Development Corp., 135 E. 42nd St., New York, N. Y.

obtained largely through increased compression ratio; more satisfactory spark timing; the burning of leaner mixtures and general detail refinements. In fuel processing this time period has seen an increase of some 60 per cent in the amount of fuel produced per unit of crude oil. This increased yield of fuel has resulted largely from the development of cracking and polymerization type processes which have contributed at the same time to the increases of fuel octane number that have made possible the increased compression ratio and improved spark timing of the engines. Lest our future use of these engines and fuels become expensive and restricted, it is important to make substantial strides in the direction that may be characterized as—more miles per gallon—more gallons per barrel—and in doing this we may be sure that we are tending toward the lowest possible power costs.

The Texaco Combustion Process (TCP) is a method for operating the combustion phase of the cycle of a reciprocating internal-combustion engine so that knock does not occur regardless of the octane number of the fuel or of the compression ratio or supercharge of the engine. TCP is relatively insensitive to fuel volatility and it readily handles fuels of a broad boiling range, such as 100 to 600°F. The features of TCP that prevent knock also allow a wide range of mixture strengths to be burned; this results in high efficiency at part load and in load control by mixture strength. TCP's elimination of knock, its toleration of wide boiling range fuels and its ability to burn lean mixtures makes it a basis for substantial improvements in the utilization of internal-combustion engines and their associated liquid fuels to attain greater power per unit of engine size, more miles per gallon of fuel and more gallons of fuel per barrel of crude petroleum. To realize these benefits, engines must be built to exploit one or more of the favorable features of TCP and this resolves itself into an exploitation of the following features:

(1) As the result of TCP's knock elimination, compression ratio may be increased without regard for the octane number of the fuel. (2) As the result of TCP's knock elimination, supercharge may be employed, in combination with high compression ratio if that is desired, without regard for the octane number of the fuel. This may be done, for example, with a small engine to reduce losses at the load of average use; with a larger engine to obtain torque variation without a complicated multi-speed transmission or simply to obtain high power from a given size of engine. (3) TCP's ability to burn lean mixtures will result in a favorable part load fuel economy in almost any TCP engine application. (4) TCP's ability to control load by mixture strength, without air throttling, makes it attractive for 2-cycle engines which have many desirable characteristics when the mixture strength method of load control can be employed. (5) A TCP engine can utilize fuels having no octane number specification and a broad boiling range. The yield of such fuel from most crude oils can be substantially greater than the combined yields of motor gasoline, aviation gasoline and diesel fuel meeting current octane number, cetane number and volatility specifications.

In an earlier publication, the concept of the Texaco Combustion Process was described and illustrated by preliminary experimental results. Since then engineering investigation of TCP has been continued to identify more clearly the technical factors involved in the design, construction and operation of TCP engines. As a result of this work, the important factors appear to have been isolated and engineering solutions have been worked out to deal with them. The present paper is intended to review the concept of the process; to outline the factors involved in TCP engine de-

TABLE I  
TEXACO COMBUSTION PROCESS - RANGE OF KNOCK FREE OPERATION

COMPRESSION RATIO	6 - 12
MANIFOLD PRESSURE	10-120 IN. OF HG ABS
JACKET TEMPERATURE	212-375°F
INTAKE AIR TEMP	90-400°F
SPEED	200-4400 RPM
LOAD	IDLE TO FULL LOAD AT ANY SPEED
FLEXIBILITY	ACCELERATION AND RAPID LOAD CHANGE AT ANY CONDITION.
IMEP	20 TO GREATER THAN 400 P.S.I.
FUELS	ISO PENTANE            TRIPENTANE ALCOHOL            150 OCTANE BENZINE            N-PENTANE KEROSENE            CETANE DIESEL FUEL            6-METHYL-NAPHTHALENE TRACTOR FUEL            (AND OTHERS)

ER 1130

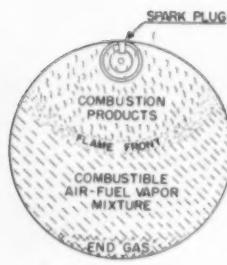


FIGURE 1

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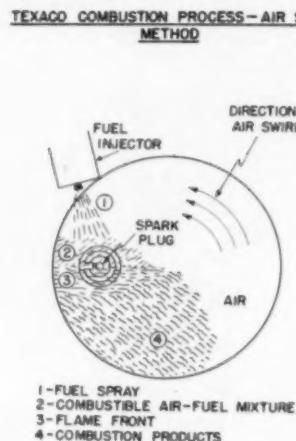
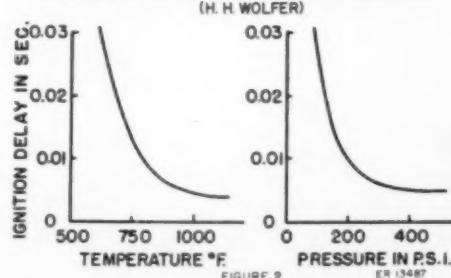


FIGURE 3

ER-9947

TYPICAL SPONTANEOUS IGNITION DATA  
(H. H. WOLFER)



## EXPERIMENTAL APPARATUS — GENERAL ARRANGEMENT

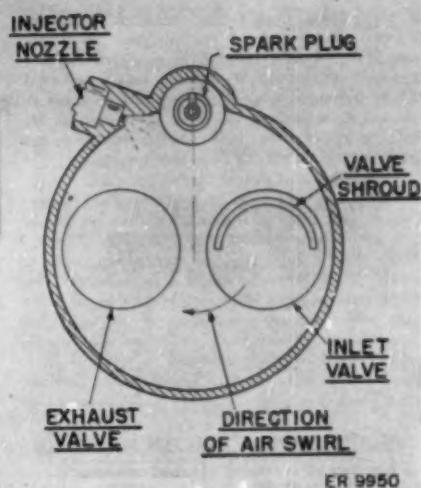
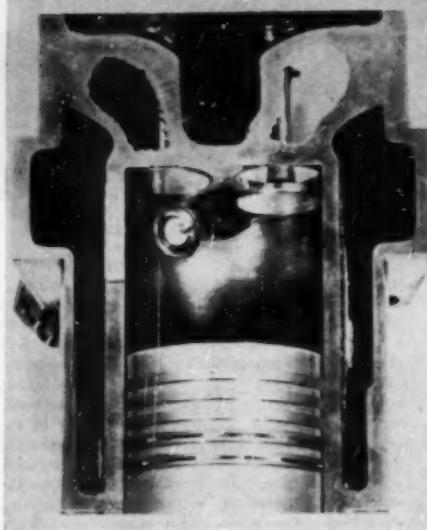


FIGURE 4

sign and construction and finally to illustrate the efficiency and performance characteristics that currently are being obtained.

**Theory of the Texaco Combustion Process** — The sequence of events that leads to the occurrence of knock in a conventional Otto cycle engine, that is, an engine operating with spark ignition and a premixed charge, is a convenient point of departure to describe the concept and theory of the Texaco Combustion Process. Figure 1 shows a typical plan view of the combustion chamber of an Otto cycle engine, with the piston near top center and the combustion in progress. A flame front has been established at the spark plug and it is burning into the combustible mixture, compressing ahead of it the unburned portion of the combustible air-fuel vapor mixture. The air-fuel vapor mixture that will be burned last, the "end gas," will be compressed to the greatest degree. Under the resultant "end gas" temperatures and pressures oxidation reactions occur which may lead to spontaneous ignition of the end gas. This spontaneous ignition has been identified as knock. Under engine conditions of end gas pressure and temperature, spontaneous ignition, or knock, almost invariably would occur if the end gas reactions were allowed sufficient time. However, the end gas may be consumed by the normal progress of the flame front before the end gas reactions reach the stage of spontaneous ignition and, in this event, no knock will occur. Thus, the occurrence or non-occurrence of knock may be likened to a race between the spontaneous ignition reactions in the end gas and the normal progress of the flame front.

In the study of spontaneous ignition reactions, three quantities are of major importance in characterizing the reaction of any given air-fuel vapor mixture. These are the pressure and temperature and the ignition delay, the latter being the residence time of the mixture at the conditions of pressure and temperature before spontaneous ignition occurs. For a given mixture, the ignition delay time decreases exponentially as the pressure or temperature is increased. Typical ignition delay data are illustrated in Figure 2. An analogy between the trends of Figure 2 and the circumstances of Figure 1 can be drawn, if we interpret pressure and temperature in Figure 2 as end gas pressure and temperature and ignition delay as the end gas residence time at that particular pressure and temperature.

It is customary to think of pressure and temperature as the cause, and of the residence time, prior to spontaneous ignition, as the effect. For the

products are carried away from the flame front. It will be noted from Figure 3, that in addition to reducing the residence time of combustible mixture at engine pressures and temperatures TCP makes it possible to burn very lean overall air-fuel mixtures by terminating the injection before all of the swirling air has been mixed with fuel. It follows that high part load efficiencies can be obtained and that the engine power can be controlled by variation of fuel quantity without air throttling during operation.

**Physical Apparatus and Typical Characteristics of the TCP Operation** — Experimental apparatus used for one of the early trials of the Texaco Combustion Process is illustrated by the photograph of a sectioned cylinder and by the plan view of the cylinder, shown in Figure 4. The cylinder shown is of the four cycle poppet valve type, 3½-inch bore by 4½-inch stroke; air swirl is induced by the shrouded valve and the spark plug is located approximately 30 degrees of arc downstream in the air swirl from the injector position. The cylinder shown was used in the earliest TCP experiments; a variety of cylinders of the same bore and stroke have been used in most of the development work; other cylinders both of the two and four cycle variety and ranging up to 6-inch bore by 6-inch stroke also have been used. All cases have involved the following common features: a method for creating air swirl, the relative location of the injector and spark plug and a combustion chamber shape that is essentially a figure of revolution. With the engine arranged generally as shown by Figure 4, the resultant operation is knock free regardless of the octane and cetane numbers of the fuel and the operation also is relatively insensitive to the volatility of the fuel. This freedom from the occurrence of knock, regardless of the octane or cetane number of the fuel, is illustrated by Figure 5, which shows curves of IMEP versus fuel-air ratio for five fuels which represent approximately the known extremes of octane and cetane numbers. All data illustrated in Figure 5 were obtained during a single continuous operating period of the engine during which no adjustments were made except to change fuel quantity as required to develop the curves and to change from fuel to fuel. The engine operation was at 1800 rpm., 10 compression ratio, 60 inches of mercury absolute manifold pressure. As the engine was changed from fuel to fuel there was no noticeable or measurable difference except the slight power changes attributable to changes in the heating value of the fuels. Figure 5 also illustrates the ability to burn lean mixtures and to control load by mixing ratio only.

It has been of additional interest to investigate the operation of TCP engines over a wide range of operating conditions to obtain assurance that the knock elimination persisted to extremes of the conditions that ordinarily are conducive to knock and to investigate the flexibility and general operability of a TCP engine. As a point of departure for these extremes, the commonest operation has been in the range of 1800 rpm., at 10 compression ratio, 90°F. intake air temperature, 212°F. jacket temperature, 30 to 60 inches of mercury absolute manifold pressure on a 24 octane number fuel having a boiling range from 100 to 600°F. Some of the more important ex-

### PATCH BURNING

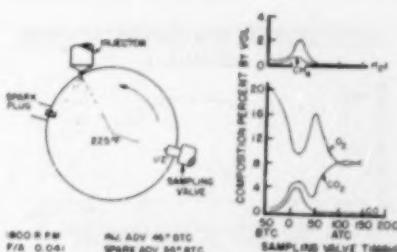
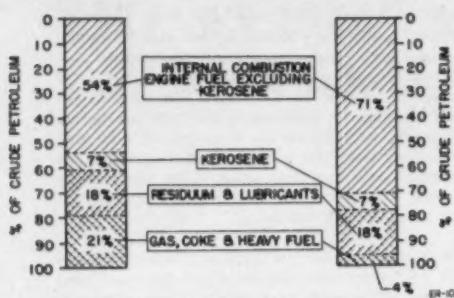


FIGURE 6

ER 1000

OTTO AND DIESEL FUEL  
MEETING CURRENT  
COMMERCIAL SPECIFICATIONS

TEXACO COMBUSTION PROCESS  
FUEL 100-800°F BORING RANGE-HO OCTANE OR CETANE NO. SPECIFICATIONS



tremes of operating conditions are listed in Table I. Throughout these ranges of operating conditions knock free operation has been obtained. Furthermore, during accelerations, abrupt load changes, et cetera, it is possible to operate without spark or injector adjustments and the general impression is that of a very flexible operation. In a TCP engine, if the injection of fuel is terminated before a complete air swirl has occurred, only a portion or "patch" of the air will have been impregnated with fuel vapor. The fuel-air ratio of the patch will depend on the mass rate of air swirl and on the mass rate of fuel injection. The patch fuel-air ratio will be greater than the overall ratio of fuel and air consumed by the engine; thus the patch is made to have a spark ignitable mixture strength even though the overall mixture is leaner than would be ignitable. The mixture ratio control of load depends on this patch burning. In an experiment, an electromagnetic sample valve was installed in an engine cylinder. The engine was operated at moderate load so that a patch of limited size was formed. Gas samples were taken by the sample valve at various times in the cycle. Figure 6 illustrates the cylinder arrangement and the composition of the gas samples obtained at various times in the cycle. The variations in composition of the gas samples with sample valve timing clearly suggest the swirling of a patch of combustion products past the sample valve. It will be noted from the gas compositions that the combustion in the patch was quite complete by the time the patch reached the sample valve on its first turn around the cylinder. The fluctuations of gas compositions also give an indication of the rate of air swirl.

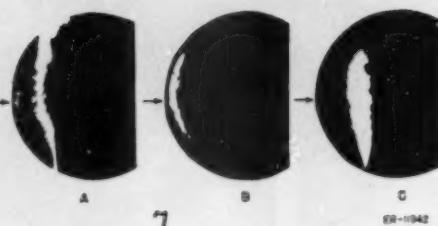
**Elements Controlling the Elimination of Combustion Knock**—As has been stated earlier, the elimination of combustion knock is obtained in the Texaco Combustion Process by limiting the residence time of combustible mixture at combustion chamber pressures and temperatures. Practically, the necessary limitation of residence time involves a coordinated consideration of the relative location of the injector and spark plug; of the direction and character of the fuel spray and of the relative timing of injection and ignition. It has been desirable to define the limits of residence time that permit knock-free operation in these specific terms.

**A. Relative Location of Injector and Spark Plug**—As the distance between the injector and spark plug is increased a larger patch of mixture is built up before ignition can take place, until finally the patch becomes so large that in some remote portion of it the permissible residence time is exceeded and knock occurs. Experiments have demonstrated that knock-free operation may be obtained

with the spark plug located between 30 and 60 degrees downstream of the injector. With the plug at 90 degrees, knock-free operation was borderline and beyond 90 degrees knock occurred. While the injector-spark plug positions must be selected in accordance with the basic idea of limiting residence time these results indicate a reasonable latitude in the choice of location.

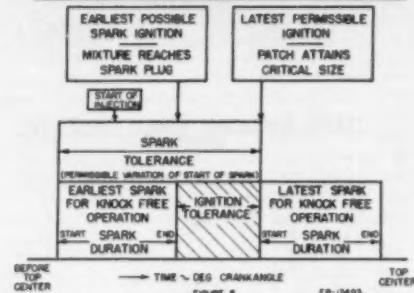
**B. Direction and Character of the Fuel Spray**—Proper fuel-spray characteristics are also important in obtaining knock-free operation. Figure 7 shows three sample stroboscopic photographs of sprays from different nozzles as observed five crankangle degrees after the beginning of injection under engine conditions of air swirl and compression. Photograph A shows an unsatisfactory spray which penetrates so far and in so concentrated a beam that it has passed well beyond the spark plug. By the time the combustible

SPRAY CHARACTERISTICS



within the period designated as "spark tolerance." This spark tolerance normally is from 15 to 30 degrees of crankangle for engines equipped with a conventional automotive ignition system. Further consideration of Figure 8 supports an observation that spark timing, within its tolerance, has a negligible effect on power output. In one case, where the start of the spark occurs prior to the onset of the ignition-tolerance period, ignition can occur at but one time—the time when the mixture reaches the plug. In the other case, where the start of the spark falls within the ignition-tolerance zone, the timing of ignition depends on spark timing. No power change is noticeable in this case, however, because the flame quickly reaches the same fixed flame-front position which it takes with earlier spark timing and thereafter combustion is controlled by injection exactly as in the first case. It is apparent then that spark timing is dependent upon injection timing and may not be considered an independent variable. The spark tolerance is so liberal, however, that a fixed timing is often satisfactory over the entire speed-load range of the engine. Taken altogether these three factors, the location of the injector and spark plug; the direction and character of the fuel spray and the timing of injection and ignition, allow for margins of error that are commen-

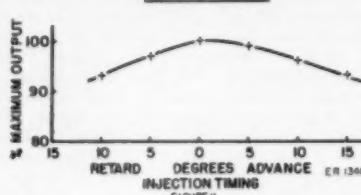
RELATIVE TIMING OF INJECTION AND IGNITION



mixture has been carried to the plug, too large a patch will have accumulated and knock will occur. Photograph B shows an unsatisfactory spray which is deflected so much by the swirling air that it forms a concentrated zone of rich mixture very close to the combustion chamber wall. The mixture at the plug may be so rich as to prevent ignition. Photograph C shows a satisfactory spray which produces a good combustible mixture in the region of the spark plug. The spray is strong enough that it is not deflected excessively by the swirling air and at the same time is not so penetrating as to pass beyond the plug before ignition. The range of sprays that will result in knock-free operation is relatively broad.

**C. Relative Timing of Injection and Ignition**—The third factor affecting knock elimination is the relative timing of injection and ignition. Figure 8 illustrates the coordination of these events. For knock-free operation a spark must exist at some

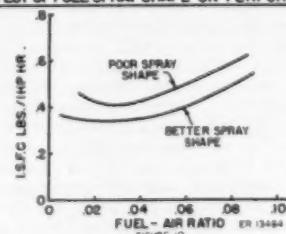
EFFECT OF INJECTION TIMING ON TCP PERFORMANCE



sature with the requirements for construction, servicing and use of engines.

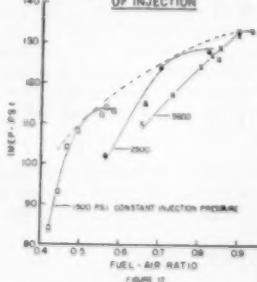
**Elements Controlling the Efficiency of a TCP Engine**—The TCP engine operation would have little more than academic interest if it were not capable of producing acceptable levels of efficiency. The elements of the Texaco Combustion Process that eliminate combustion knock do not automatically lead to good efficiency unless other conditions are satisfied as well. Efficiency as used here is not only the efficiency with which the engine uses its air and fuel but also that with which its displaced volume is utilized. More efficient use of displacement can be taken advantage of either as higher engine power or as smaller engine size. Efficiency in this broad sense is determined by the elements that affect the breathing capacity of the

EFFECT OF FUEL SPRAY SHAPE ON PERFORMANCE

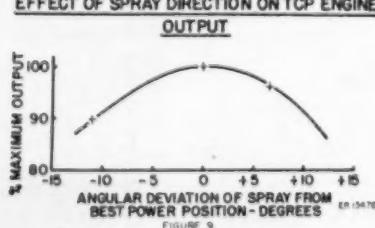


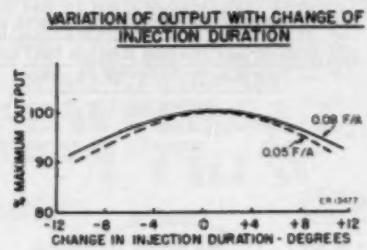
time during the period designated as "ignition tolerance." If the spark has died out before this period commences, the engine will either misfire or fire by compression ignition, depending upon the quality of the fuel. If the spark does not start until after this period has passed, the patch of combustible mixture will be so large, and accordingly the residence time so long, that the occurrence of knock will be dependent upon the octane value of the fuel as in a carbureted engine. To avoid these conditions or, in other words, to operate on the Texaco Combustion Process, it is necessary that the start of the spark be somewhere

EFFECT OF DURATION AND RATE OF INJECTION



EFFECT OF SPRAY DIRECTION ON TCP ENGINE OUTPUT

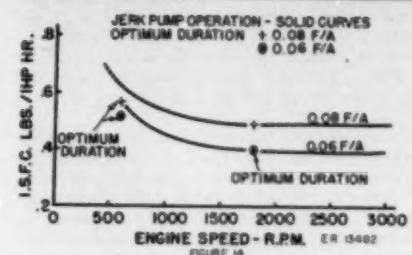




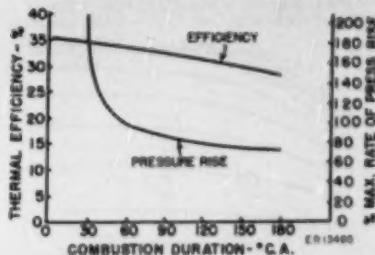
engine as well as by those which affect the utilization of air and fuel.

**A. Breathing Capacity**—The type of TCP operation under discussion requires the existence of air swirl in the cylinder during the time of combustion. While this swirl can be produced by a variety of methods, the one used chiefly has been by induction through a suitably designed intake port equipped with a shrouded intake valve. This method, although subject to severe loss in volumetric efficiency if inadequate care is taken in the design, has been refined to the point where good volumetric efficiency is compatible with production of the required air swirl. Details of engine design and use, however, play such an important part in both sides of any comparison of volumetric efficiency with and without air swirl that a sound generalization would require a much fuller discussion of the subject than is appropriate here. At the risk of oversimplification, however, the statement may be made that a well-designed induction system producing suitable swirl for TCP may be substituted for a conventional system without loss in volumetric efficiency up to mean piston speeds of 2,000 to 2,500 ft./min. for naturally aspirated engines and higher for supercharged en-

#### JERK PUMP INJECTION VS OPTIMUM DURATION



#### EFFECT OF DURATION OF COMBUSTION

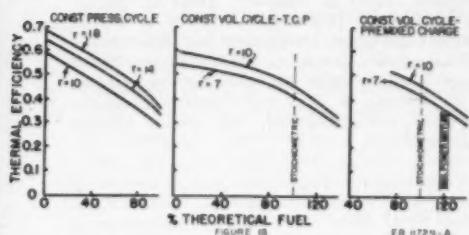


of ISFC versus speed at each of two fuel-air ratios as obtained from a conventional jerk-pump fuel injection system with a fixed area nozzle which had been matched to the engine's requirement at 1,800 rpm. By way of comparison, corresponding ISFC's obtained with optimum duration of injection at each of two speeds are shown. The fixed area nozzle used in this case is particularly disadvantageous for operation over a wide range of speeds. Improvements in the type of nozzle used should yield improved performance, particularly at very high and low speeds. While this performance improvement is desirable, the performance penalty now observed is gratifyingly small and it is not a serious deterrent to TCP's usefulness.

**3. Air Swirl Rate**—All the elements which characterize the spatial and temporal distribution of the fuel may be characterized by the spray pattern and by the position of the spray in the cylinder and these two elements play an important part in attaining maximum air utilization for full-load operation. An acceptable spray arrangement from this standpoint is the same one pictured in Figure 7C, which produced good knock-free operation. It more or less uniformly impregnates the air with fuel. As shown by Figure 9, a spray of this sort will tolerate a change in direction about the point of injection with only minor change in engine output. As Figure 10 shows, however, an unsuitable spray arrangement may cause an appreciable loss in efficiency even though it results in knock-free engine operation.

**2. Temporal Distribution of Fuel**—The temporal distribution of the fuel may be characterized by the timing, rate and duration of injection. Injection timing determines the time in the engine cycle during which the charge is burned and, as is shown by Figure 11, the effect of injection timing is similar to the effect of ignition timing in a conventional spark ignition engine. Rate of injection, in conjunction with rate of air swirl, controls the fuel-air ratio of the successive increments of mixture formed, and thereby the efficiency of combustion. With the injection rate fixed by the injection system, injection duration then controls the output of the engine by controlling the total amount of fuel which enters each cycle. To determine the required rates and durations of injection a special pump was developed with which the beginning, rate and duration of injection can be adjusted independently. Application of this pump produces results similar to those shown in Figure 12, where each hook-shaped curve corresponds to a given average rate of injection, and the successive points along the "hook" correspond to increasing durations of injection. Obviously, the envelope of the curves represents the best duration of injection for the particular engine under test. The variation of engine output with injection duration may also be plotted directly as in Figure 13. When the durations and average rates of injection, corresponding to the envelope curve of Figure 12, are duplicated in a conventional jerk-pump injection system, engine performance with a jerk-pump system falls on the envelope curve of Figure 12.

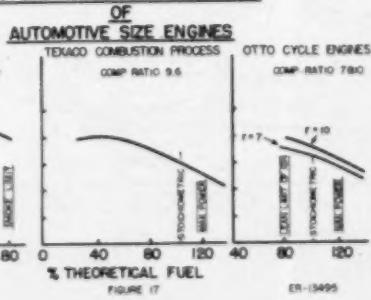
#### THEORETICAL THERMAL EFFICIENCIES (BODDENOUGH AND BAKER)



gines. In most cases, then, breathing capacity will not be diminished by the requirement of air swirl. On the other hand, in many cases the breathing capacity of a TCP engine may be increased over that of a carbureted engine, for breathing capacity depends upon manifold density as well as upon the volumetric efficiency of the port. Manifold density is generally higher for the TCP engine because it requires no carburetor pressure drop for metering purposes and no external addition of heat for vaporization.

**B. Utilization of Air and Fuel**—The efficiency with which the air and fuel are utilized is dependent chiefly upon the coordination of fuel injection with air swirl. Basically, every increment of air in the cylinder must receive, in its turn, the

#### ACTUAL THERMAL EFFICIENCIES

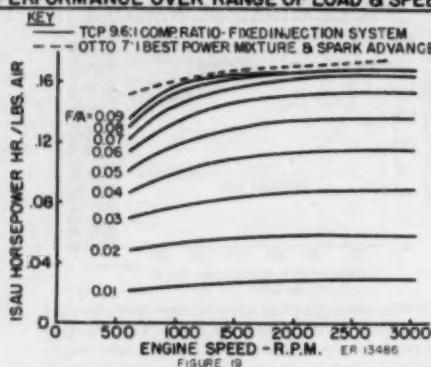


Depending on the detail of the particular components used, a jerk-pump fuel injection system will show some variation with speed in the number of crankangle degrees required to inject a given quantity of fuel. This variation of the injection system does not necessarily "gee" with TCP's variation in optimum duration of injection with speed. These two factors combine to cause some loss in efficiency at speeds higher and lower than the speed at which the injection system's duration of injection was matched to the engine's requirement. Figure 14 illustrates this effect by a curve

#### COMPARATIVE PERFORMANCE (AUTOMOTIVE SIZE ENGINES)



### PERFORMANCE OVER RANGE OF LOAD & SPEED

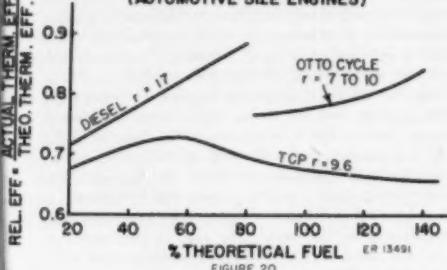


**Comparative Efficiency of the Texaco Combustion Process**—It is convenient to examine the efficiency of the Texaco Combustion Process by comparison with the efficiencies of the other two cycles, Otto and diesel, with which it will have to compete.

**A. Theoretical Thermal Efficiency**—First, consideration will be given to the theoretical thermal efficiencies of the three types of combustion, as shown in Figure 16. The curves are all based on the analysis of Goodenough and Baker for the fuel-air cycle with theoretical shape of indicator cards and no heat loss. The Constant Pressure Cycle is the theoretical Diesel cycle. In current practice, the compression ratio averages about 16. The Constant Volume Cycle with Premixed Charge is the theoretical Otto cycle, approached

#### RELATIVE EFFICIENCY

(AUTOMOTIVE SIZE ENGINES)



by spark ignition engines. In current practice, compression ratios from 5.5 to 7.5 are used. The Constant Volume Cycle—TCP, the theoretical TCP cycle, is identical with the Constant Volume Cycle Premixed Charge from 120 to 80 per cent theoretical fuel. It is, however, extended into the region of very lean mixtures by the ability to "patch burn." Present thoughts are that a TCP engine would be used in the range of 10 compression ratio, as a compromise between high efficiency and excessively heavy engine construction.

**B. Actual Thermal Efficiency**—Actual thermal efficiencies for Diesel, Otto and TCP engines are shown in Figure 17, on a basis comparable to that used for the theoretical efficiencies. The Diesel engine data are representative of a variety of engines in the range of 17 compression ratio. Because of smoking, the mixture strength seldom exceeds 80 per cent of theoretical fuel, that is, 80 per cent of the fuel for complete combustion. The Otto cycle engine data represent a variety of test and commercial engines in the automotive size range. These engines operate in the range from 80 per cent of theoretical fuel, the lean limit of spark ignition, to 120 per cent of theoretical fuel, maximum power. Light load operation is achieved at the expense of air throttling and its attendant pumping losses. The TCP engine data apply to a 3 1/4-inch bore, 4 1/2-inch stroke engine at 9.6 compression ratio at 1,800 rpm. The operation covers the full mixture strength range up to maximum

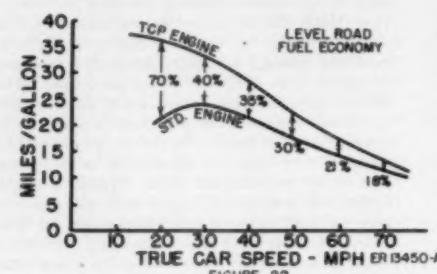
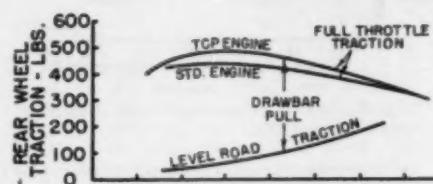
power at 120 per cent of theoretical fuel. Note that the TCP does not exhibit either the smoke limit of the Diesel or the ignition limit of the Otto cycle engines. For this reason, TCP combines in a single operation the two best features of Otto and Diesel engines, namely, the power output of the former and the fuel economy of latter.

**C. Comparative Indicated Performance**—Further light is shed on the relative performance of the three engines by a comparison of their utilization of fuel and air. Figure 18, a plot of Indicated Specific Fuel Consumption (ISFC), expressed as pounds of fuel per indicated horsepower-hour, versus Indicated Specific Air Utilization (ISAU), expressed as indicated horsepower-hours per pound of air, is particularly suitable for this comparison. The latter expression is, of course, proportional to indicated horsepower once the air consumption of the engine is known. This plot uniquely defines the performance of an engine, since both variables are determined by the mixture strength and the corresponding value of thermal efficiency. Superimposed on this plot are curves for the three sets of thermal efficiency data of Figure 17. The Otto-cycle, as may be seen, operates at high output and high fuel consumption, and is limited on the lean end by misfiring. The Diesel engine, on the other hand, operates at low fuel consumption but also in a lower range of output, never attaining the high output of an Otto-cycle engine. The TCP curve covers the range of both of the other cycles and merges them into a single curve which approaches both the low fuel economy of the Diesel and the high output of the Otto cycle. Thus, the TCP combines in a single operation the two best features of Otto and Diesel engines, namely, the high part-load fuel economy of the Diesel and the high full-load power of the Otto-cycle engine. The TCP performance upon which these comparisons have been based was all obtained from an engine with a conventional jerk-pump injection system with a constant orifice area nozzle and with the system operating at the speed at which it was matched to the engine requirements. At any other speed this same system does not match as well. Nevertheless, the single, compromise system performs well over a range of speeds, as is shown in Figure 19, and its output varies little more than that of the Otto-cycle engine operating at best-power mixture and spark advance.

**D. Relative Efficiency**. The ratio of the actual indicated thermal efficiency of an engine to the efficiency of the ideal process upon which the design of the engine is based may be called the relative efficiency. Relative efficiency is a measure of the perfection of the design or of the state of development of the actual engine. Relative efficiencies for Otto and Diesel engines and for a TCP engine, at its present state of development, are shown by Figure 20. As might be expected from its relative newness, the TCP engine is shown to

### COMPARATIVE HIGH GEAR PERFORMANCE OF A POPULAR CAR, POWERED BY ITS STANDARD ENGINE AND A NATURALLY ASPIRATED TCP ENGINE

STD.ENGINE      TCP.ENGINE  
COMP.RATIO, 6.60:1      9.65:1  
FUEL      ANF-58, TRACTOR FUEL  
REGULAR      NAVY SPECIAL FUEL OIL, ETC.

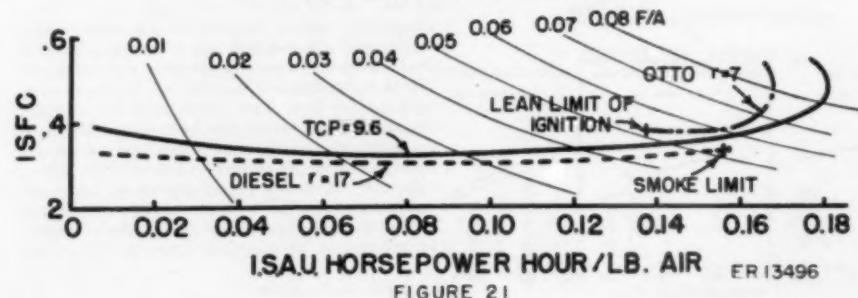


be at a lower state of development than either of the other engines. It seems reasonable to assume that additional development work can bring TCP to about the same level of Relative Efficiency that the Diesel and Otto-cycle engines have attained. On this assumption, the comparative performance will be approximately as shown in Figure 21. Additional development will be desirable and there is no apparent reason why Relative Efficiencies comparable to those of Otto and Diesel engines cannot be obtained. However, the attractiveness of TCP does not appear to depend on this additional development but rather on the characteristics already at hand, namely, that it combines in a single operation the best performance features of Otto and Diesel-cycle engines without introducing the fuel quality requirements of either.

**Comparative Car Performance and Availability of Fuels**—The information now at hand, without considering the possible future developments, is sufficient to consider a multicylinder TCP engine for operation in an automobile and to make an accurate estimate of its resultant performance. The most elementary form of TCP engine—four cycle, poppet valve, naturally aspirated—will exploit a minimum of TCP's potential. However, it offers a fair basis for a preliminary comparison.

... and now please turn to Page 70 ...

### COMPARATIVE PERFORMANCE WITH COMPARABLE DEVELOPMENT (AUTOMOTIVE SIZE ENGINES)



## DIESEL LIGHTSHIP WITHOUT A CREW

U. S. Coast Guard Engineers are completing machinery tests on a 91-ft., 215-ton, crewless lightship at the Coast Guard Yard, Curtis Bay, Maryland, just south of Baltimore. After a continuous 2-months' service trial, EXP-99 will be stationed near Scotland Light Vessel, one of the three lightships now marking the approaches to New York harbor. By remote control from shore, one man at the Sandy Hook, N. J., Coast Guard Station will operate EXP-99's light, radio beacon, and fog signal. Using his remote controls, the Coast Guardsman ashore will be able to shift power supply between any of the three generators. The engines which drive the three generators are Buda diesel engines. These engines were modified by the Norfolk Naval Shipyard for use in driving generators by removing the clutch and reverse gear and fitting a new base with dry sump. A special cylinder head developed by the Naval Shipyard was also installed to insure reliable operation under light loads. These engines develop 24 bhp. at 1,200 rpm., the rated speed of the generators. The three generators, the three engine starting and control panels and the Visicode supervisory control systems installed on this vessel were all manufactured by the Westinghouse Electric Corporation. By remote control the operator will turn the fog signal off and on. And should one of the two radio beacons "konk-out," he could shift to the other also by remote control. Twin lenses with a 500-watt bulb in each furnish a 10,000 total candlepower light. If both twin lights should burn out, a remote possi-



Anchored on station, *Experimental Lightship 99* is unique among the 37 manned lightships operated by the U. S. Coast Guard. She will have no crew!

bility, a battery-powered emergency light would cut in automatically, and a signal would tell the shore operator that the main light is out. An automatic pump will keep water in bilges at a safe low level.

Ship equipment completely fills the space normally used by propelling machinery. The lightship will have to be towed to its station and anchored. Economy is the big reason for producing the new crewless lightship. Of the 37 manned lightships guarding important United States shipping lanes, each has a crew of one warrant officer and approximately 16 enlisted Coast Guardsmen. Original cost of a manned lightship is \$750,000, as compared with \$375,000 for an unattended or crewless lightship, including shore remote control equipment. An annual saving in cost due to reduced personnel

on an unattended lightship would be \$38,000, plus \$21,000 a year that would be saved in supplies and food. The idea of an unattended lightship is not new. Such a craft was operated successfully from 1935 to 1939 in Lake St. Clair, a small lake in the rivers connecting Lake Huron and Lake Erie. This inland lightship was replaced by a fixed structure in 1939. The new lightship, however, will be the first unattended U. S. lightship in ocean use. In view of recent developments in off-shore oil-drilling structures in the Gulf of Mexico, Coast Guard engineers believe that fixed structures could be placed where sea-going lightships are now stationed, although present costs are prohibitive. If this first unattended lightship at sea gives satisfactory service, it may lead to the gradual replacement of all manned lightships.

(Left) Coast Guardsman Robert V. Dor shows with a flip of a finger how the station can control the lightship by remote control. Workmen install the three Buda diesel-generator engines which provide power for the link between lightship and shore station.

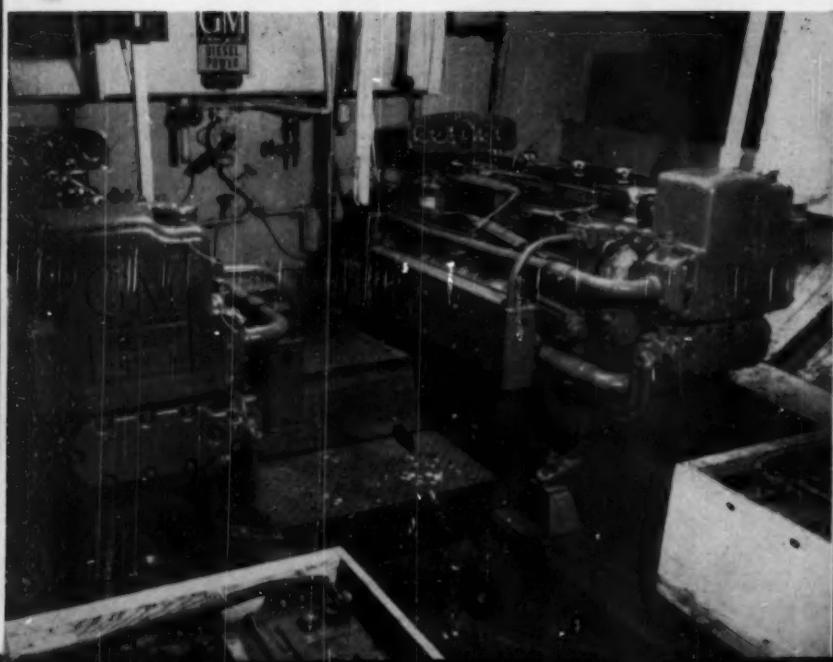
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## STAR ANGLER

JOE MARTIN is one of the most popular and successful sport fishing captains in and around San Pedro, Long Beach and Wilmington, California. His latest sportfisher is the *Star Angler*, a 65-foot by 18-foot by 7-foot wood hull built in 1936 by the San Diego Marine Construction Co. from designs by Oakley J. Hall. The re-powering of this fine commercial sportfishing vessel with a pair of G-M diesels (model 6071A) has given the ship a net increase in speed of  $2\frac{1}{2}$  knots, she now cruises at 13 knots and has a top speed of 16 knots with the engines revving at 2,000 rpm. Joe Martin takes his passengers out from San Pedro as a rule and fishes to Catalina and back. His customers like the new power plant, it's smooth, gives the ship a nice turn of speed and when the signal comes "let's go home" that 16-knot top speed comes in very handy. Crofton Diesel Engine Company of San Diego and San Pedro did the engine conversion job on the *Star Angler*.

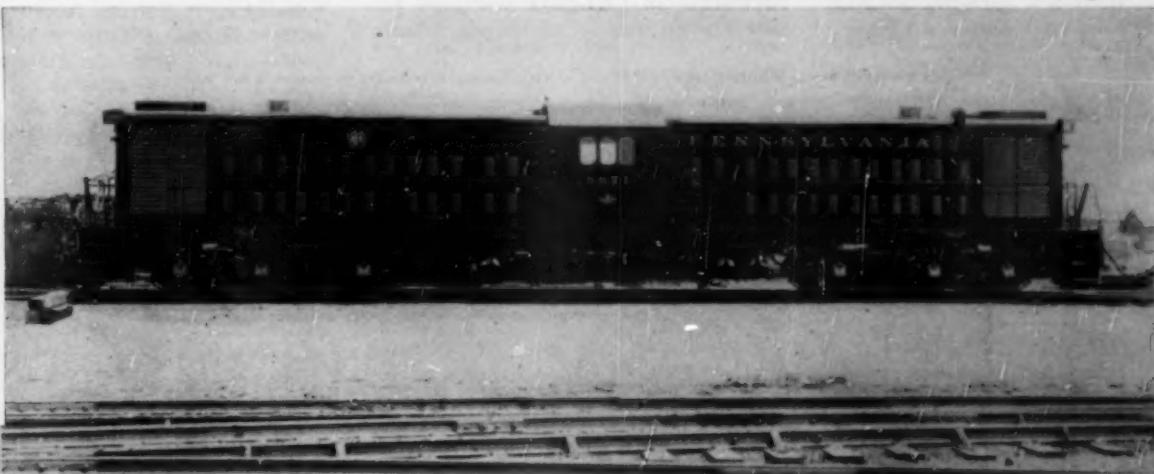


**L**IMA-HAMILTON Corporation, from its Lima Locomotive Works Division at Lima, Ohio, has delivered to the Pennsylvania Railroad the first of eleven 2,500-hp. diesel electric transfer locomotives on order for the Pennsylvania. The new diesel electric is, we believe, the first 2,500-hp. locomotive built in the country, and is the second largest diesel electric ever built as a single unit. At the same time, Lima-Hamilton announced that in addition to its 800, and 1,200-hp. switchers, it has added a 2,400-hp. unit to its standard line. This new locomotive is similar in many respects to the 2,500-hp. diesel built for the Pennsylvania and described here. These three locomotives—the 800, the 1,200 and now the 2,400—currently round out the Lima-Hamilton diesel locomotive line with units suitable for all kinds of hauling for road, yard, and general industrial service within the capacity of the individual locomotive. All locomotives are built at Lima, and are powered by Hamilton diesel engines, manufactured by the firm's Hooven, Owens, Rentschler Company Division at Hamilton, Ohio. Of steeple cab design, the 2,500 diesel is of the C-C wheel arrangement, with the single cab mounted on the frame which is carried on two six-wheel side-equalized swivel trucks with a motor on each axle. The operator's compartment is located in the center of the locomotive, with a power plant hood extending to either end of the unit. The rating of 2,500-hp. is the combined brake hp. of the two engines—see illustration at bottom of this page. The locomotive is powered by two Lima-Hamilton

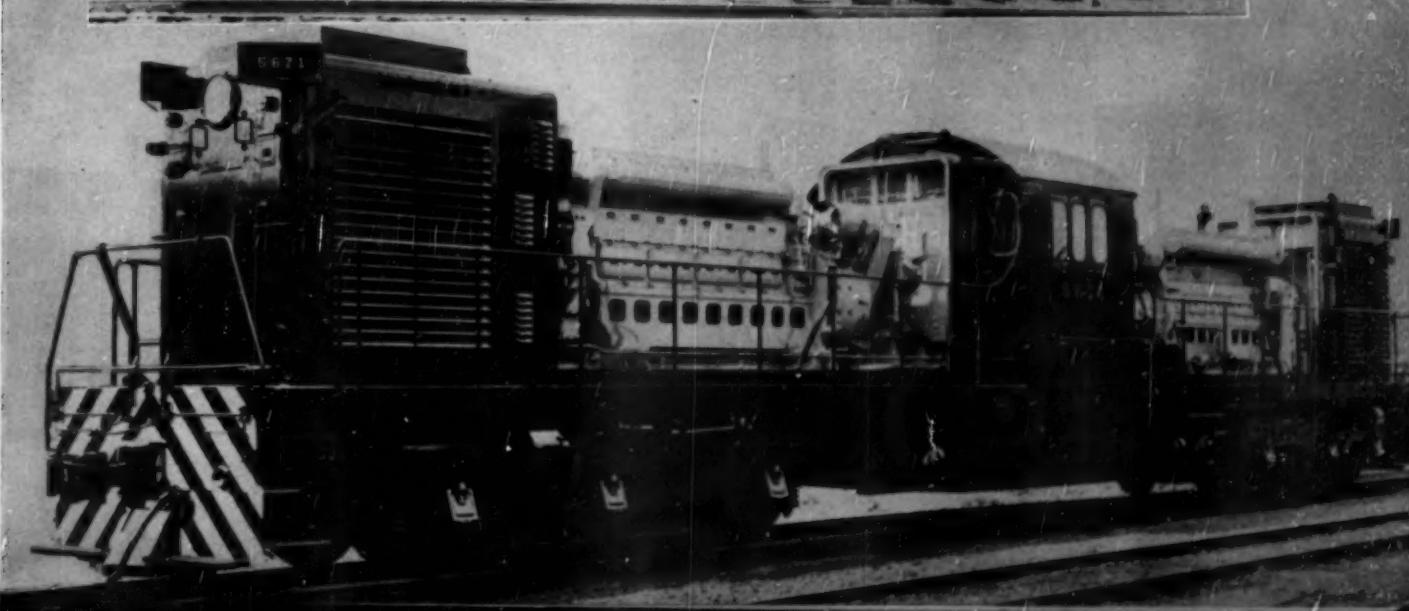


9-inch by 12-inch vertical 8-cylinder diesel engines of the 4-cycle, single acting, pressure charged type. Each of these engines develops a full 1,250 brake hp. The locomotive, which weighs 180 tons in working order, has a maximum speed of 65 mph. Starting tractive force of the locomotive (30 per cent adhesion) is 108,000 lbs. Maximum height to top of cab is 14 feet 6 inches, while the maximum width over brake cylinders is 10 feet, 2½ inches, and over hand rails is 9 feet, 11½

inches. Length inside coupler knuckles is 79 feet; distance between truck centers is 49 feet; truck wheel base is 18 feet; total wheel base is 61 feet, 3 inches and the diameter of the wheels 42 inches. The various capacities are as follows: fuel oil, 1,250 gallons; cooling water, 450 gallons, and lubricating oil, 290 gallons. With few exceptions, all locomotive components of the new unit, are similar in construction to components of the 800 and 1,200-hp. Lima-Hamiltons.



87



# KEY WEST GETS A FRESH WATER SUPPLY

**After Generations, Tied to Rain Barrels and  
Pumped-in Seawater, Key West Citizens Get  
a Dependable Fresh Water Supply.**

By HARRIE H. BIERMAN

**I**n a day in July, 1942, a Navy Public Works officer at the Key West Naval Station replaced the telephone instrument in its cradle with a smile of satisfaction. Then, he stepped into a lavatory and turned on a water tap. Nothing happened. But the PWO knew perfectly well that it wouldn't—not yet. He had just received word that the Navy's new water pumping station at Florida City had gone into operation. At the southeasternmost tip of the North American continent, a diesel engineer had opened an air valve, and twin Fairbanks-Morse diesel engines began to turn over smoothly. The pumps were drawing water and sending it on its long journey through the 18-inch mains at 2,100 gpm. The PWO knew, well enough, that it would take hours for the water, which had just gone into the pipes, to make its 132-mile journey to its ultimate destination. In fact, he knew within a few minutes just about when the water was due to run out of that lavatory tap. It was all in neat figures on a sheet of paper in his desk. At a flow-rate of 3 feet per

second, it was a simple problem in mathematics.

Just as the Public Works Officer was clearing up his desk for the day—the third day after the diesel engines began turning over—he heard a gush of water in that lavatory tap. At last—at long, long last—Key West and its Naval Station had a real fresh water supply. And the word flashed to Washington, "Mission accomplished."

The Navy went 132 miles for its water, because Florida City was the nearest point at which a fresh water source was (and is) available. True, there is land between the end of the Florida Peninsula and Key West—there has to be, if piping was to be paid—but it is a chain of semi-tropical "keys" (islands). These, so far as the writer ever could learn, have no natural source of fresh water, except caught precipitation.

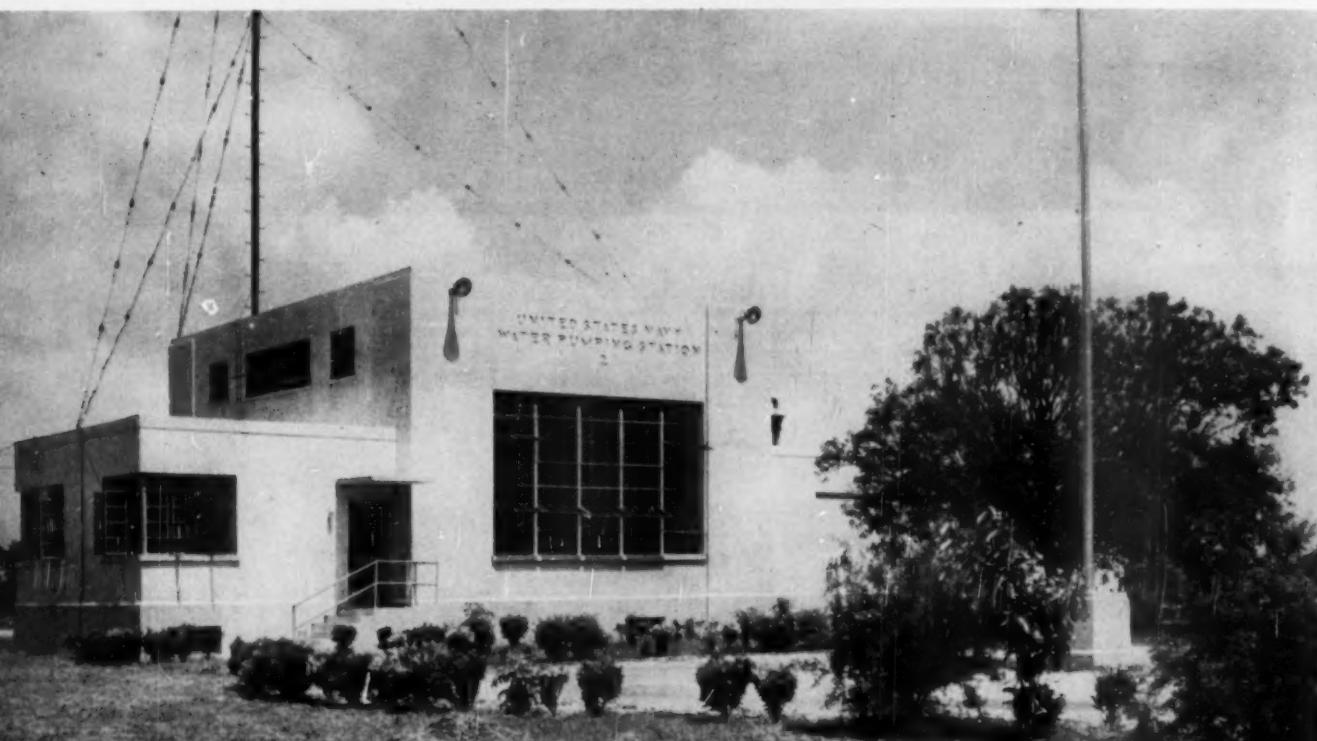
With its current production of three million gallons of potable water per day, the plant supplies

the Naval Stations at Key West and Boca Chica (an adjoining key) plus the civilian needs of the City of Key West and those of the intermediate key settlements, of which there are at least a dozen. During the winter season, the civilian population in the area is augmented considerably. Approximately one-half of the plant's output must be earmarked for civilian use. And, out of its share, Navy must supply Navy craft, which happen to need water. Incidentally, the water piping system has a potential capacity of approximately seven million gallons per day.

The main power of the plant, when it first went into operation, consisted of two Fairbanks-Morse 300-hp. diesel engines having a 14-inch bore and a 17-inch stroke and operating at 300 rpm. A high percentage of the accessory equipment is of F-M manufacture or was F-M supplied.

With this power setup and equipment the plant operated efficiently and economically for four

Navy's booster station at Marathon steps up flow rate of water during latter part of its journey to Key West.



years. During the drought period mentioned, the diesel engines pumped the water from the "auxiliary" well, as well as through the pipe lines, to its various destinations. Fuel oil consumption averaged (and still does) 1 gallon of fuel for each 8,300 gallons of pumped water. In 1946, some changes were deemed necessary—for several reasons. For one thing, civilian demands had been stepped up. As civilian consumers gained confidence in the unfailing dependability of Navy's water system, they leaned on it more heavily. Therefore, to step up flow velocity and volume, a booster plant was installed at Marathon, between the Florida City plant and Key West. For another thing, South Florida engineers, and those familiar with the area, are partial to alternative power sources. To implement these dual objectives—and a third one, which will be explained later—one diesel engine and one Dayton-Dowd pump were transferred to Marathon. And, to replace these units at the main plant, a Westinghouse 400-hp., 2,300-volt, induction motor was installed. Operating on 3-phase, 60-cycle purchased current, this motor powers a De Laval 2-stage pump, having a capacity of 2,100 gpm. at 1,785 rpm. and a total head of 600 feet.

The diesel engine powers a two-stage pump with a capacity of 1,800 gpm. at a head of 500 feet. The engine speed of 300 rpm. is increased to a pump speed of 2,000 rpm. by a speed step-up. These are the pumps which send the water on its long journey through the pipe lines to Marathon. The diesel engine at the main plant, now, serves a double purpose: (1) as an alternative power source; (2) as a booster. The current-supplying utility has its own problems. And not the least of these is an unpredictable, seasonal current-demand. This "peak-load" usually occurs from late afternoon to mid-evening, during the months from December to March, inclusive. Therefore, those quantity current-consumers, who have auxiliary powering, are asked to use it during the period of peak load. Consequently, the Navy pumping plant may switch, at will, to all-diesel powering for its pipe line water transmission during the utility's peak load periods. Important, also, to the powering setup is the fact that the diesel engine serves as a "standby" in case of a current failure. And, in summer, when there is a high water demand from consumers, it can use both its powering sources to boost flow-velocity at the main plant. For this purpose, the pumps are hooked up in series.

For alternative powering, in the event of a current failure—a not-too-infrequent occurrence in the case of long transmission lines and periodic storm seasons—there is a Continental 6-cylinder, 50-hp. gasoline engine. The change-over from electric to gasoline powering is made through a Twin-Disc clutch and a Johnson 90-degree power take-off, having a ratio of  $1\frac{1}{2}$  to 1. When making the shift to gasoline engine power, a 2-part drive collar is engaged with the pump shaft through the power take-off, when the male half of the drive collar engages the female half by means of two dowel pins. The clutch applies engine power to pump shaft through a double universal joint.

The diesel engine and pump moved from the



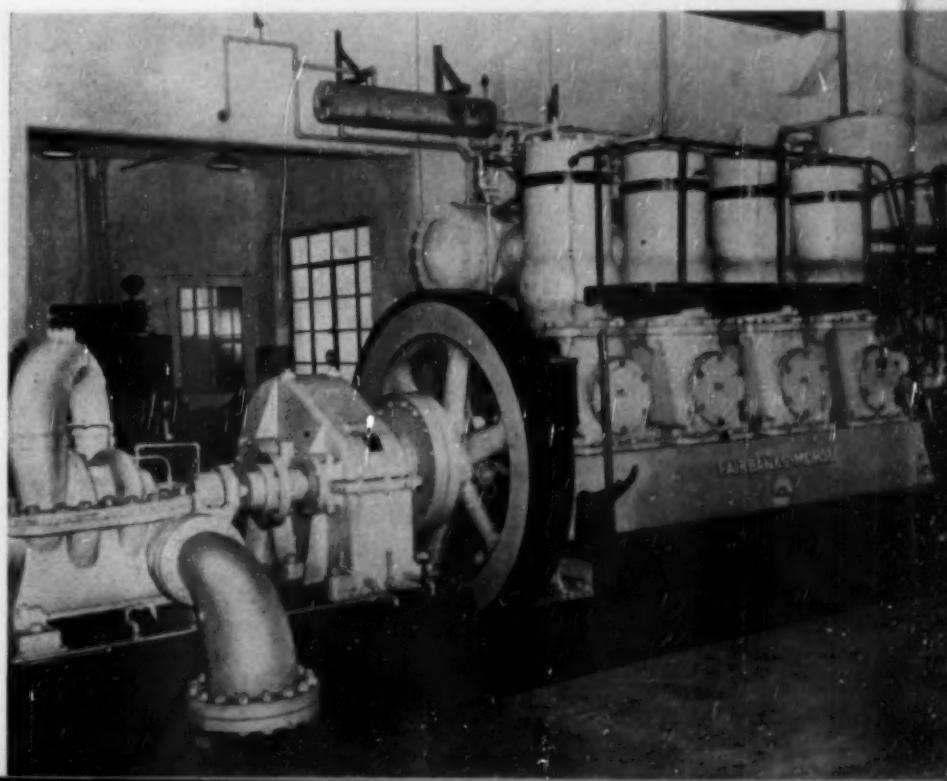
Main pumping plant at Florida City.

Florida City plant to the booster station at Marathon are housed with various items of auxiliary equipment in a roomy concrete structure. The diesel-powered pump takes the water delivered from the main pumping plant, 85 miles distant, and boosts it along to its ultimate destination at Key West. The booster pumping set-up has increased the system's flow-rate by about 400,000 gallons of water per day. Noting the high degree of building activity on the Keys and at Key West, the writer asked how much the present delivered volume could be increased, if necessary. He was informed by Navy pumping station personnel that

present equipment, plus two properly placed, additional booster stations, conceivably could be made to deliver volume up to seven million gallons of water per day—or an increase of approximately 66½ per cent.

From the foregoing, it will be seen that in its two pumping plants and in its pipe lines Navy has set up a dependable source of fresh water supply for itself and for civilian consumers in all the Keys communities and in Key West. After many, many years of using rain water cisterns, the latter now may be safely junked.

Fairbanks-Morse Model 32-E-14, 300-hp. diesel engine and Dayton-Dowd pump (left) at Marathon booster plant raise pipe-line flow-volume at Key West 400,000 gallons per day.



# ALUMINUM ALLOY BEARINGS IN DIESEL ENGINES

By D. B. WOOD\*

**E**XPERIMENTAL work on the development of aluminum alloys for bearings has been carried on by Aluminum Company of America for over 10 years. Also, some development work on aluminum bearing alloys had been reported in both England and Germany, with the result that some data had been accumulated on the performance of those materials in test engines, as well as those in actual service. As a result of research by Aluminum Company of America, the 750 type of alloy was introduced in 1939 for bearings. The following table gives the mechanical and physical properties of 750 alloy, which is now available in two tempers:

	750-T5	750-T101
Tensile Strength psi.....	22,000	23,000
Yield Strength (Tension) psi..	10,000	16,000
Yield Strength (Compression) psi.....	10,000	16,000
Shear Strength psi.....	14,000	.....
Endurance Limit psi.....	9,000	.....
Elongation, per cent.....	12	8
Brinell Hardness.....	45	50
Rockwell Hardness ("H").....	75	85
Density.....	2.88	2.88
Thermal Conductivity.....	0.44	0.44
Coefficient of Thermal Expansion per F.....	.0000135	.0000135

Nominal Composition: Tin 6.5 per cent, Copper 1 per cent, Nickel 1 per cent, remainder commercially pure aluminum.

The "T5" temper of alloy 750 indicates that the material has been given a stabilizing heat treatment after casting, whereas the "T101" temper

signifies that the casting has been given 4 per cent cold work after a stabilizing heat treatment. As laboratory data and test experience in the field accumulated, it soon became evident that alloy 750 in the stabilized condition would need additional strength where high operating temperatures existed. This led to subsequent cold working, which increased the yield strength about 6,000 psi. Where a bearing is required to meet higher service temperatures in diesel engines, another aluminum alloy has been developed. This alloy, called B750, contains higher concentrations of copper and nickel than alloy 750 and also has an addition of magnesium. Alloy B750 has the following approximate mechanical and physical properties:

	B750-T5
Tensile Strength psi.....	30,000
Yield Strength (Tension) psi.....	20,000
Yield Strength (Compression) psi.....	20,000
Elongation, per cent.....	5
Shear Strength psi.....	21,000
Brinell Hardness.....	70
Rockwell Hardness ("H").....	100
Density.....	2.88
Thermal Conductivity.....	0.43
Coefficient of Thermal Expansion per F.....	.0000135

Laboratory tests indicate that B750 will retain interference fit or crush up to about 300°F. when proper initial crush allowance is made. This bearing alloy should not be used in conjunction with journals which have a brinell hardness of less than 300, nor should it be used where much dirt is present or where alignment and tolerances of engine parts are not good. Test results indicate that

B750 alloy parts show a performance comparable with that of bronze in many bushing applications. Practically all diesel engine builders have tested or are now testing samples of aluminum alloy bearings. Although most of this test work has been successful, the few failures that have occurred in laboratory and field tests can be attributed in every instance either to improper installation or lack of understanding of the design requirements for aluminum alloy bearings.

Most of the commercial production of bearing alloys by the Aluminum Company of America have thus far been in alloy 750, with nearly all bearing material being furnished in the form of permanent mold castings. Those characteristics that make aluminum alloy bearings adaptable for diesel engines use are:

(1) The ability to carry heavy loads. In several tests where the effective area of the bearings has been reduced in order to increase the unit bearing load to very high values, aluminum alloy bearings have performed satisfactorily with loads ranging from 7,500 to 8,000 psi. In fact, some bearings were found suitable with loads approaching 10,000 psi. In this range, however, every detail must be correct to obtain satisfactory performance. Normally, a load of 5,000 psi. may be taken as the maximum figure at which successful operation should be expected, unless there are details in the mechanism which relieve or help those conditions that usually limit load carrying ability.

(2) The aluminum alloy bearings have good plasticity. In use, particles of dirt may become embedded in the surface of aluminum alloy bearings. The degree to which these particles will embed and the quantity taken up will probably depend upon the relationship between the hardness of the shaft and that of the bearing. Aluminum alloy bearings will conform to any normal misalignment of engine parts, and they can be scraped-in by conventional methods to conform to irregularities of contacting surfaces. In this respect, aluminum alloy bearings are probably better than any other bearing material except babbitt.

(3) Aluminum alloy bearings are highly resistant to adherence with adjacent parts. In the event of failure, aluminum alloy bearings will not damage the journal, except possibly in cases where seizure has been very rapid and high localized stresses have been encountered. Because of the relative softness of aluminum alloy bearings, scratches are easily made in their surface. However, they do not tend to pick up or scuff unless some other unfavorable conditions exist.

(4) Because of their ability to transmit and dissipate heat rapidly, aluminum alloy bearings will

\*Aluminum Co. of America Development Div., Cleveland, Ohio, Works.

normally operate at lower temperatures than bearings made of some other metals. For this same reason, there is a tendency for local points of high temperature to even out much more quickly.

(5) Aluminum alloy diesel engine bearings are fabricated from a single piece of material. Therefore there are no heat barriers at the bond line, or bonding layers which may fail in service through fatigue.

(6) Aluminum alloy bearings are highly resistant to corrosion from oils in use today. In addition, they do not react with these oils to form harmful products.

(7) Aluminum alloy bearings, because of their basic simplicity, should be low in cost when compared with the more intricate duplex or multiplex products designed to do a similar job.

To obtain the full benefit of the advantages offered by aluminum alloy bearings, however, consideration must be given to the following factors in designing and installing the bearings. (A) Aluminum has about twice the coefficient of thermal expansion of ferrous materials. It is essential, therefore, that ample oil clearance be provided along with closely controlled crush and sufficient end clearance. Oil clearance should always be at least .00125 inch per inch of journal diameter. This is a minimum value, and all dimensional tolerances should apply to the plus side. In case of very small diameter bearings, a minimum of .002-inch total oil clearance should not be violated. In considering crush, tests have shown that a load of 2,000 psi. on the parting line area of the bearing will normally give good contact between the back of the bearing and its housing. Using this figure of 2,000 psi. as an inspection load, manufacturing tolerances of the bearing itself add to actual parting line joint crush, as does also the use of a bearing checked in a given fixture and used in a smaller radius engine bore. It is obvious, therefore, that manufacturing tolerances of the bearing and the housing should be held to the closest practicable limits in order to control crush adequately. It seems illogical that the same tolerance should be specified or maintained regardless of bearing diameter or length. A table such as the following may be helpful in controlling this situation: Tolerance on circumferential length of bearing in fixture of radius = one-half maximum bore. Loaded to 2,000 psi. parting line area.

Tolerance (Inch)	Journal Diameter (Inches)
.0000 - .0010	1½ - 3
.0000 - .0015	3 - 5
.0000 - .0020	5 - 7
.0000 - .0025	7 - 9
.0000 - .0030	9 - 12
.0000 - .0035	12 - 20

This would provide larger manufacturing limits as the diameter of the bearing increases, and would tend to keep the actual stress in the bearing shell (caused by crush) more evenly distributed throughout a range of bearing sizes. Stress in the bearing shell resulting from manufacturing tolerances on the bore should be calculated and added

to the stress caused by manufacturing tolerances of the bearing itself and the inspection load stress. Another factor that affects crush stress is the taper to the parting line face of the bearing. Usually this taper is expressed as a certain tolerance regardless of the length of the bearing. However, some breakdown as to bearing length, such as the following table may give more uniform results:

Tolerance allowable on taper of parting line face from plane of face of fixture of radius one-half maximum bore diameter.

Tolerance (Inch)	Bearing Length (Inches)
+	0 - 3
- .00025	3 - 6
+	6 - 9
- .00050	9 and over
- .00075	
+	
- .00100	

Naturally, the manufacturing tolerance on bearing shell thickness increases with bearing diameter. Spread at the parting line may be critical with aluminum alloy bearings if limits normally used with steel backed bearings are adhered to. With aluminum alloy bearings, spread at the parting line should be held to .000-inch to .005-inch. This figure gives excessive stress in some cases, but it may be the limit to which bearings can be held in quantity production. Anything less than this upper limit of .005-inch will help to keep bending stresses at a proper level. (B) - Engines should be reasonably clean before starting. In order to obtain trouble-free operation, extreme care should be exercised to see that the entire engine is clean internally. It is difficult to understand why more time is not spent in cleaning a mechanism which represents so large an investment in material, labor and engineering. Oil filters and strainers of adequate capacity should be provided, but they should not be used in lieu of thorough cleaning. Many bearing failures can be attributed to dirt

left in the engine, and the resulting damage may make the engine a problem throughout its life.

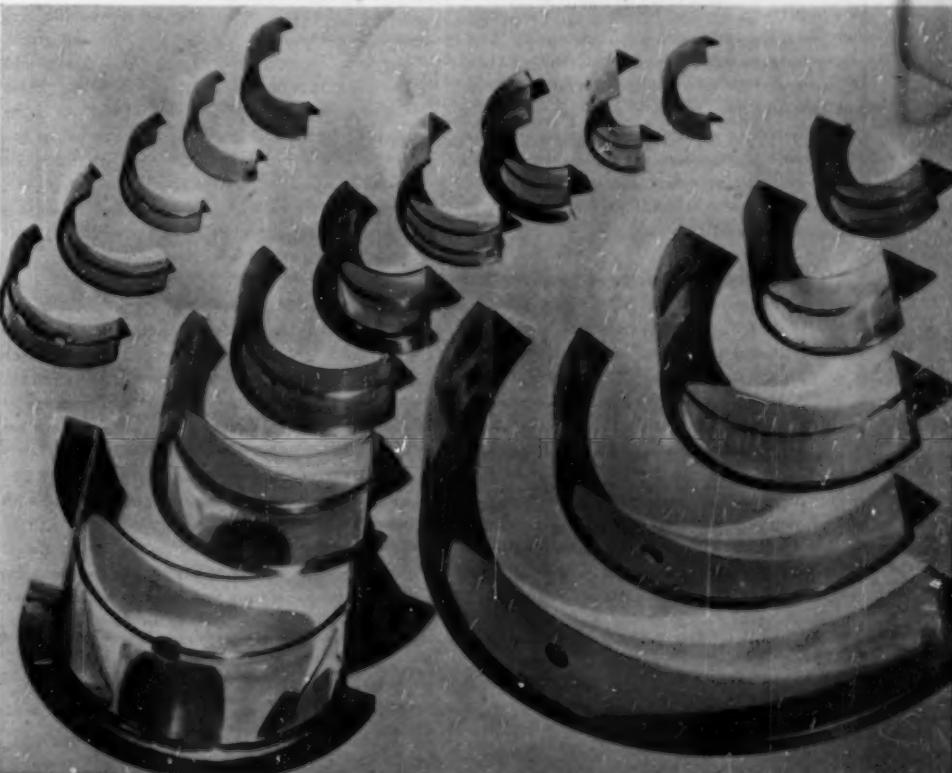
(C) Some provision should be made to provide positive lubrication at the instant the engine starts. While aluminum alloy bearings will live under very adverse conditions, no true evaluation has yet been made of the critical initial start. Oil pumps of ample capacity should be provided and a large quantity of oil should be circulated throughout the engine.

(D) Diesel engines do not normally operate with sump oil temperatures that are high enough to be critical with respect to aluminum alloy bearings. There are instances, however, where existing high temperatures could be corrected or controlled through the use of adequate oil coolers capable of handling a large quantity of oil. This may be particularly important where an engine would be called upon to maintain maximum horsepower for an extended period of time.

(E) Care should be exercised in handling aluminum alloy bearings so that nicks and gouges will not result on the surface.

Where conditions are not favorable to trouble-free operations, a corrugated bearing surface (in the direction of rotation) and tin or babbitt plating of the running surface, may be beneficial. Aluminum alloy bearings should not be expected to support abnormal loads, such as may result if shims are used in machining parts and then removed in installation. Although the diesel engine industry is rapidly gaining experience with aluminum alloy bearings, it will be some time yet before all the experience and data already collected can be evaluated. It can be fairly stated, however, after five years of actual use and twelve years of laboratory and engine tests, that aluminum alloy bearings assure excellent service at a reasonable cost in diesel engines.

Bearings and connecting rods are of solid aluminum composition.



# E

# Exchange Your Diesel Maintenance Ideas

CONDUCTED BY R. L. GREGORY

## Maintenance of Auxiliary Equipment on Diesel Units

**M**OST of us at some time or other have experienced the necessity of removing an operating unit from service, due to the failure of some of the auxiliary equipment. Such an incident is not to one's liking and in certain instances the breakdown of the auxiliary equipment is due to conditions beyond the operating personnel's control. However, in a majority of cases the failure can be traced back to lack of proper inspection and timely maintenance. We also are aware that any operating diesel unit is only as efficient and dependable as the weakest part of the unit, including the auxiliaries. Therefore if we want efficiency, dependability and low plant costs, we must maintain the auxiliaries with the same vigilance and care that we exert in keeping the main unit in efficient condition.

In modern diesel plants, the amount of auxiliaries required generally depends upon local conditions and the types of units being operated. These auxiliaries generally consist of the following: (1) Raw and soft water circulating pumps with heat exchangers, for the cooling system; (2) Auxiliary lube oil pumps with purifiers and strainers; (3) Auxiliary fuel oil pumps, with centrifuges or purifiers, heating equipment and tanks; (4) Auxiliary air compressors, starting bottles and air injection units, the additional blast bottles; (5) Scavenging blowers or pumps; (6) Air filters. These of course do not take into consideration storage tanks for both fuel and lube oils, spray ponds or cooling towers or standby fuel handling and lube oil equipment. However, all these various items need periodical inspection and maintenance, the frequency of which depends largely on local conditions and operating practice.

**Raw and Soft Water Circulating Pump** — Most plants today are equipped with either the conventional centrifugal pumps mounted on a base with the driving motor and connected by means of a coupling, or the later type of pump where in the motor rotor and the pump's impeller are mounted on the same shaft with the pump housing attached to the motor frame, thus making a more compact unit. In either case the maintenance is practically the same. The frequency of inspection on such units, along with the amount of maintenance required, depends entirely upon the cleanliness of the circulating agent, and the hours of operation to which the units are subjected. If conditions permit, it is always desirable to over-

haul such units at least once a year, being particular to note the condition of the impellers, the wearing rings, the bearings, stuffing boxes and packing or rotary seals and the shaft sleeves and nuts. Also if the suction pipe is equipped with a foot valve, this should be inspected also. Foot valves are made in two types, one known as the flap type, the other a multiple spring type. The flap type is more to be desired as a rule, but particles of dirt, twigs or leaves may get between the seat and the valve, thus interfering with priming.

Now as to inspection of the pump parts themselves, often foreign matter will get into the veins of the impellers or lodge in the volute, especially where the suction pipe is not protected by a foot valve or screen. This impairs the efficiency of the pump. As a case history, we had the bulb of a temperature alarm break off after long service and eventually lodge on the veins of the impeller. This disrupted the normal pump operation and when inspection was made this condition was found. When this bulb was removed, the pump was reassembled and operated normally. The shaft sleeves and nuts are important. Most shaft sleeves are made of bronze, cast iron or nitroloy and are placed over the shaft to protect it from wear of the packing. These are renewable and should be changed when they show signs of grooving from contact with the packing. Care should be taken in removing and reinstalling these sleeves, making sure that the sleeves are tight against the impeller hub on either side of the impeller and drawn tight in place with the shaft nuts. It is always good practice to coat the shaft well with white lead and oil before installing the sleeves on the shaft. This protects the shaft from rusting and corrosion.

Bearings should be inspected for wear. Also the wearing rings in order to ascertain that proper clearances are being maintained between the wearing rings and impeller. Most of the efficiency of the pump depends upon a proper clearance at this point. The stuffing boxes and packing are of prime importance. The stuffing boxes of most pumps are provided with a water seal ring or lantern ring, which ring is provided with water from the casing through passages built in the casing or from external piping. Each one of these passages are provided with a needle valve so that proper sealing may be obtained by adjustment of the valve. This is an easy adjustment

and provides ample water where the pump is handling clean water. However, when the pump is handling dirty water or water which contains scale or rust, as is often found in a circulating cooling system, it is well to provide the water for the seal from a clean water source, using external piping. This sealing water passage should always be inspected. Normally a  $\frac{1}{4}$ -inch pipe line is sufficient, and a  $\frac{3}{8}$ -inch line can be used on larger pumps of this type, but regardless of the clarity of the water, these pipe lines will eventually clog with rust and hinder proper sealing action. The pressure of the water on these seals generally runs from 10 to 50 pounds, depending on the size of the pump. Certain specific points should be noted in repacking any pump. First the stuffing boxes should be cleaned by removing the old packing and flushing or scrapped out. Then the packing should be carefully cut to proper length, so that the ends just come together and do not overlap. Sufficient packing should be placed behind the water seal or lantern ring to bring the ring directly below the sealing water line. If this is not done the water comes in on the packing and does not provide proper sealing. As the rings are installed, each ring of packing should be staggered so that joints will not come opposite each other. Care must be taken not to pull the packing too tight. If too tight the packing will score the shaft sleeves and burn the packing, thus destroying its usefulness and effectiveness. The pump rotor should be easily turned by hand after repacking, otherwise the packing is too tight. The most effective way to repack a pump is to just snug it up, finger tight, then operate the pump with the sealing water turned on and make the adjustments while the pump is in operation. Packings differ in their reaction to swelling after they are placed in use and frequent adjustment of the packing glands is necessary until the packing becomes "set," so to speak, with the proper sealing effects. The leakoff water from the water seal and packing should come out between the shaft and packing gland at the bottom, since this water not only performs the function of sealing but also acts as a lubricant between the packing and shaft sleeve. When the glands are pulled up against the packing, care must be observed to see that they are square against the packing and that the proper clearance is maintained between the shaft and the gland bore. This is especially true with split glands, as it is so easy to get a misfit with this type of gland. If the gland is a little cocked to

one side or the other or in the up and down position, rubbing of the gland against the shaft will cause friction and heating will result. Care should be taken in selecting the proper packing, which should on this type of pump be a soft, well-lubricated packing that will reduce resistance to a minimum and prevent excessive wear on the shaft sleeves. If in doubt as to the proper type of packing, consult the manufacturer for his recommendations or the representative of some reputable packing company.

**Heat Exchangers**—While inspecting your pumps and the cooling system, remember that the heat exchangers contribute a vital duty to the system and must be included in the maintenance program. Most of the present day heat exchangers are so constructed as to be easily cleaned. The tube bundles can be removed, cleaned and re-installed without too much trouble. However, this is not generally necessary unless you run into leaky tubes. Most of them can be cleaned by removal of the upper and lower heads, the inner tube surfaces can then be cleaned with a suitable wire brush and washed or flushed afterward. The heat exchanger for cooling the circulating water is likely to accumulate scale on the outside of the tubes and deposits of iron oxide. To really clean the chamber around the tubes, there are several products on the market which give good results.

Many plants have constructed a portable cleaning unit for this work which consists of a tank and circulating pump mounted on a platform, equipped with large casters or wheels to make it mobile. This tank is filled with the cleaning mixture and by means of the circulating pump this mixture is circulated through the exchanger and returns to the tank. Hot water is usually used, but in case cold water is used, we generally attach a steam hose to one of the several connections in the exchanger and apply steam to the mixture as it is circulated. After circulating the cleaner for two or three hours, the length of time depending upon how dirty the exchanger is, the mixture is drained off and clean water used to flush the exchanger. This is then drained off and the exchanger closed up, ready for use.

On the heat exchanger for the lube oil the process followed is about the same. Usually a certain amount of sludge and congealed oil is encountered and one must make sure this is all removed. Then the foregoing process of cleaning and flushing is followed out with the additional precaution of applying air pressure to the top of the exchanger and blowing all the moisture out of the bottom drain. After doing this any moisture remaining within the confines of the exchanger will be negligible and give no trouble. Such coatings as congealed oil, sludge, scale and scum form an insulator and must be removed in order to get proper cooling from the exchangers. This is particularly true in the hot weather when the heat exchangers need to be in good operating condition.

This discussion will be continued in the next issue and the writer will take up the maintenance of other auxiliary equipment.

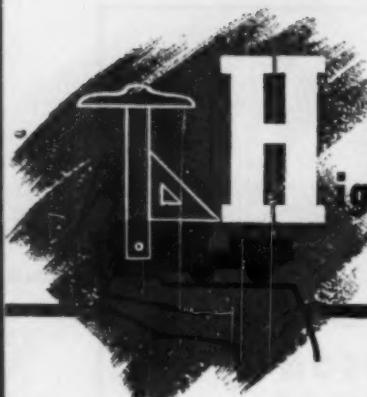
The advertisement features a central circular collage composed of four smaller images: a truck, a factory interior, a ship, and a locomotive. To the right of the collage, the text "JOHNSON BEARINGS" is written in a bold, sans-serif font, with "Designed FOR DIESEL ENGINES" in a larger, italicized font below it. In the bottom left corner of the collage, there is a dark rectangular box containing the following text:

You will find Johnson engineers willing to help you decide which type bearing is best suited and to design it to the application. Write, wire or call today!

Below the collage, the text "The wide Variety of uses for diesel engines certainly demands specialized engineering. Each type of engine must be built for specific operating conditions. Likewise, the bearings, as well as other parts, need to be designed for the required load, shock, speed, temperature and other service considerations. Johnson Bronze furnishes the bearings for a majority of the diesel builders because, through extensive research and engineering cooperation, we have designed and produced the right bearings. Among the preferred types are aluminum alloy bearings and lead or tin base babbitt on either bronze or steel backs. Every Johnson bearing is made of quality material and finished to precise specifications."

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## High-Speed Diesels . . . Design, Operation & Maintenance

CONDUCTED BY H. G. SMITH

### WATER PUMP

**I**N THE July issue of DIESEL PROGRESS the overall cooling system of high speed diesel engine equipment was discussed. It covered the proper maintenance and care of the radiator gauges, pressure caps, etc. Discussion of the water pump was purposely avoided because it is so important that it should be given separate consideration. When we realize how much work this assembly does, it really commands a lot of respect and likewise careful attention. The cooling system of a large truck or other large piece of equipment, for example, removes enough heat at cruising speed to keep a 35-room house warm in freezing weather. To handle this heat load, it may be necessary for the cooling system in some engines to circulate as much as 4,000 to 10,000 gallons of coolant every hour of operation.

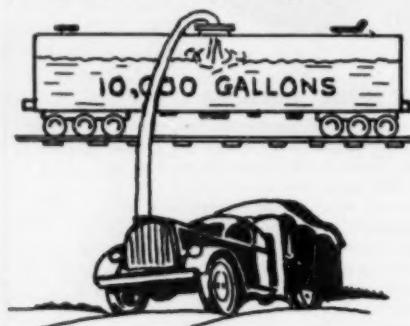


FIG. 1

In the high speed diesel engine class the water pumps are of the centrifugal type having an impeller with blades which force the coolant outward as the impeller rotates. The impeller is located in a pump housing and is mounted on a shaft which runs on one or more bearings. The fact that the impeller is submerged in the coolant, but must be driven from outside of the cooling system, creates the problem of sealing the impeller shaft against leakage. The water pump shaft seal is the only moving water joint in the cooling system. The water pump in some installations is combined with the fan assembly, in which case it is usually driven by belts. Other installations have the water pump mounted on the side of the engine block and is positively driven by a take-off shaft. See Figures 2 and 3. In Figure 2 the pump is sealed by placing packing around

the shaft and holding it in place with a special adjusting nut. The packing must be tightened periodically and replaced at certain intervals. This type usually requires periodic lubrication. Always use a good grade of special water pump grease, never use ordinary cup grease—it will wash away too easily and will provide no lubrication either to the bearing or the packing, which both need continuously. In Figure 3 is shown the type of pump that is most commonly used today. It is the non-adjustable packless type. It has built into it a self-adjusting seal. Individual pumps vary somewhat in seal materials and arrangement of assembly. Some packless pumps are prelubricated when assembled but others require some periodic lubrication. If either type water pump reaches the point where they are leaking and demand attention, remember the following points:

In the packing type pump, be sure the shaft is replaced if after adding packing it still continues to leak. In time the shaft does become grooved due to the packing continually rubbing on it. If these grooves are too deep, no style or amount of



FIG. 2

packing will last very long. Replace the shaft with a new one and you will save yourself time and money.

The so-called packless type pump will in time require the replacement of the seal washer which is usually a mixture of special carbon and other materials. When this is necessary be sure that the surface of the housing on which the seal runs is square, smooth and repolished. If the surface is at all grooved or uneven, which it usually is, the new washer will not be able to

seal properly. All the running in you may do will not help. It is necessary to reface the housing face or if in refacing more than 1/16-inch needs to be taken off, it is necessary to replace the housing. The reason you cannot remove too much from this face is due to the fact that the seal washer is held against this face with a predetermined spring pressure and any reduction of spring pressure might allow the seal to be forced away from the surface in operation. You may also find that the slots in the impeller which do the driving of the seal washer are badly worn. If they are worn too much the impeller should be replaced because any sloppiness in these slots may permit the seal washer to jump around in operation and cause the seal to wear excessively or possibly break

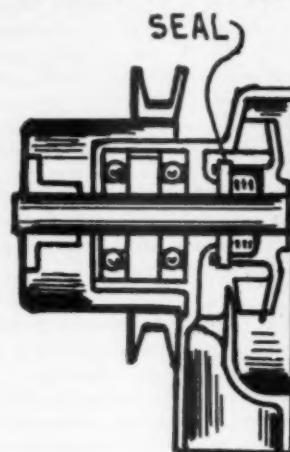


FIG. 3

off the fingers of the seal washer. Some designs have the seal in a complete housing which when replaced avoids any impeller replacement. Another thing that is generally not known about packless pump seal washers, is that they must not have any lubricating oil or grease on their faces when installed; in fact, there have been cases brought to my attention where the oil from the hands have caused trouble. Before installing a seal washer clean the sealing surfaces of both the seal and the housing quite thoroughly with gasoline or carbon tetrachloride to remove any trace of grease or oil.

Switch to

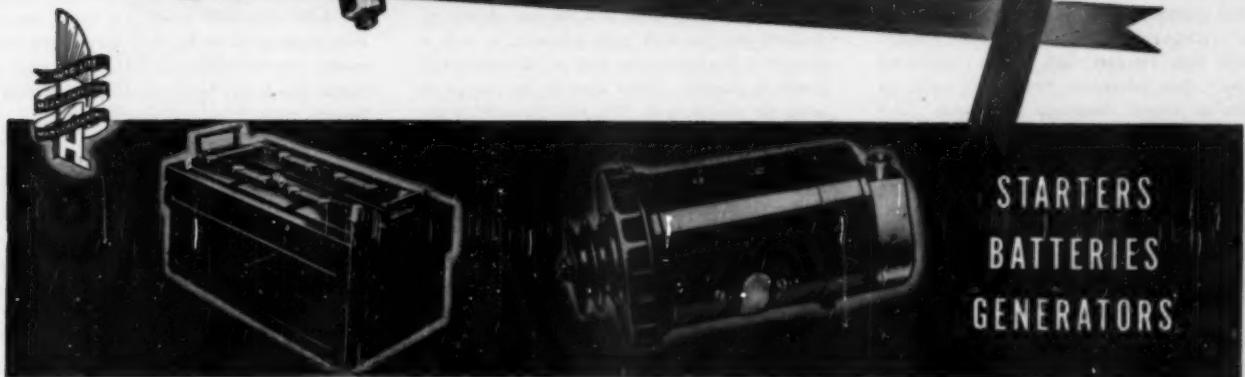
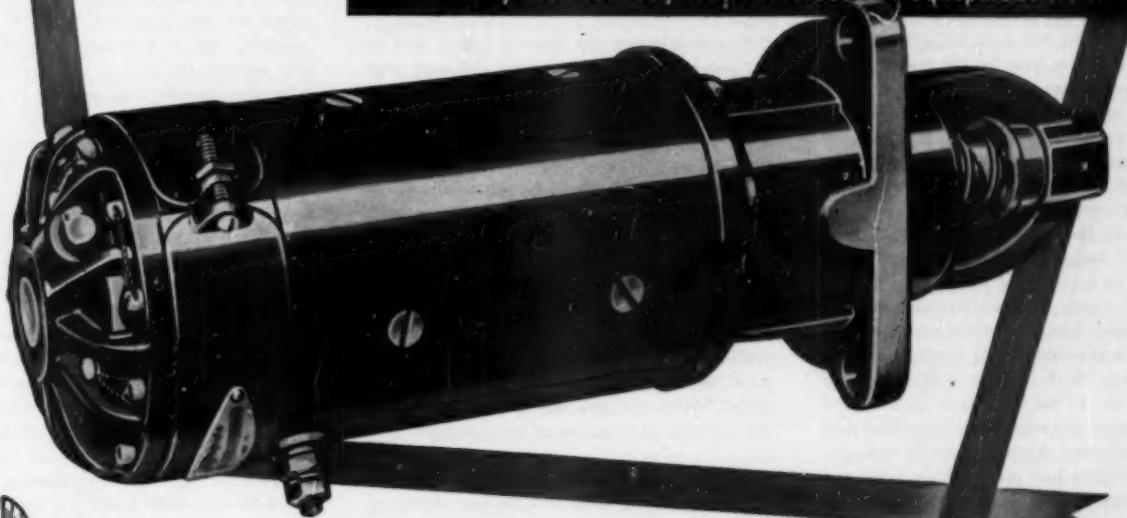
# AUTO-LITE

## diesel equipment

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## Supervising & Operating Engineers Section

CONDUCTED BY R. L. GREGORY

### Further Questions Concerning Diesel Operations

**T**WO problems are frequently mentioned in communications by our readers when corresponding with this department. Many of them want information and advice on units operating with a smoky exhaust. The other question frequently asked concerns knocking in an engine which operates perfectly normal as far as temperatures, cooling, mechanical conditions and efficiency are concerned. That is, they appear normal to the questioner.

As to the first question let me state that a smoky exhaust is usually the indication of faulty combustion, not always, but in a majority of cases. Imperfect combustion may be the result of any one or a combination of conditions, such as excessive fuel supply, improper atomization, improper scavenging conditions, late injection, unsuitable fuel, excessive exhaust back pressure, or mechanical defects. Smoky exhaust may also be the result of overloads or over lubrication. So with so many factors effecting combustion, it seems that the logical procedure to determine the cause would be a process of elimination. One of the principal causes of imperfect combustion is that of excessive fuel, and where this condition appears it can generally be the result of a defective fuel pump, check valve to improper setting of the rack rod. In the majority of modern slow speed diesel units, the single injection type of fuel pump predominates. Each cylinder is equipped with its individual fuel pump, check valve and rack rod controlled from the governor. This type of fuel pump consists of a barrel and plunger operated from the cam shaft and is constructed with such close tolerances that it will build up pressure of several thousands of pounds. This pressure is maintained by a check valve, the tolerances of which are very close and with a perfectly lapped valve and seat. Both the fuel pump and check valve must be in perfect mechanical condition in order to function properly. Should the fuel be dirty or contain moisture, these parts may become corroded or pitted, making them sticky and ineffective, or should a minute particle of dirt lodge on the check valve seat, and hinder the valve from properly closing, its effectiveness would be destroyed. Excessive fuel might be injected by improper setting of the fuel pump rack rod. Another cause of poor combustion can be traced to improper atomization of the fuel. This

in turn depends on the mechanical condition of the atomizer, fuel needle valve and seat, scavenging and cooling conditions. On air injection units the packing of the fuel needle valve, if improperly done, can bind the needle valve and hinder the proper functioning of that part. Again the type of fuel may have something to do with atomization, since all injectors and atomizing equipment are designed to handle certain types of fuel. If fuel which does not conform to specifications of fuel handled by the type of atomizer equipment being used, improper combustion may result.

Proper atomization also depends a great deal on the proper scavenging conditions and there must be sufficient scavenging air supplied if one is to have proper combustion. The writer is familiar with an installation where the scavenging air is supplied by a separate blower. Supposedly this blower was of ample size to furnish an abundance of scavenging air for the unit. However, with ample pipe size leading to the scavenging header and a minimum of friction loss, with the blower at full speed and the control damper wide open, it is impossible to operate the unit at rated capacity without developing a smoky exhaust, regardless of the temperature of the incoming air. It is therefore rather convincing that this particular blower is a little undersize for furnishing the required scavenging air at rated capacity.

Late injection is another cause for improper combustion. The timing in this instance should be checked and the rack rods adjusted in such a manner as to equalize the load on all cylinders as nearly as possible. Then there is the matter of using the proper fuel. This was discussed in the paragraph devoted to atomization. Proper fuel must be used. Care must also be taken in seeing that the exhaust ports and exhaust piping and muffler do not clog up, thus producing excessive back pressure on the unit.

Another feature which may cause a smoky exhaust is over lubrication. When an excessive amount of cylinder lubricant is used, the excess oil will burn, thus causing a smoky exhaust. Mechanical difficulties such as faulty rings, allowing blowby, moisture in the fuel, defective piston heads or insufficient cooling, causing overheating, will also result in smoky exhaust. From the foregoing it is appar-

ent there can be many causes for smoky exhaust.

Now as to the matter of knocking in an engine or in one particular cylinder of the unit, when apparently everything is normal, this can be caused by several conditions also. One of these conditions is the formation of a shoulder on the liner at top piston stroke. This situation has been discussed in former articles. When such a shoulder develops the top ring is likely to strike it, especially if it is not removed when new rings are installed. If a shoulder develops it should be removed and the liner well honed at this point. Another cause of knocking is insufficient clearance between the ends of the rings to allow for expansion when the rings get hot. As they expand the rings are crowded out against the cylinder walls and in many instances where the ports are not properly chamfered will hit the ports on the up and down stroke, causing a knocking sound. This invariably results in broken ends of the rings if not an entirely broken ring. A still further cause may be found in the wiper assembly. If this assembly is not pulled tightly and squarely up against the bottom of the liner, there may be a knock in that particular cylinder due to the looseness of this assembly as it moves up and down with the stroke. It doesn't have to be but a few thousandths to cause a thumping noise which will become very annoying at times, although it is not a serious situation. Still it should be corrected. Of course loose bearings, wrist pins, and worn parts will result in a knock, but these soon show up by rising temperatures and can be readily located. Other factors which may cause engine knock may be overcooling, insufficient lubrication, early firing and improper fuel.

A great deal more could be said about all of these conditions, but we have just listed some of the high points causing the difficulties asked about, and it is such trouble as a smoky exhaust or a knocking engine which worries the average operator when he is unable to lay a finger on the cause, as he is always imagining that something more serious is in the offing. Consequently he is curious and this is as it should be, since conditions as named above can and eventually will develop into more serious situations if allowed to continue, to say nothing about the inefficiency of the unit until they are corrected.



## WHAT'S GOING ON IN ENGLAND

CONDUCTED BY HAMISH FERGUSON

Hamish Ferguson was appointed Secretary to the Diesel Engine Users Association in London in 1944. Previously senior technical assistant to Diesel and Insurance Consultants, London, and for several years with English Electric Company in the designing and erection of large diesel generating plants. Mr. Ferguson continues to do independent consulting work.

**A**T A recent luncheon given by the B.I.C.E.M.A., at which the Minister of Supply, Mr. George Strauss, was principal guest, the report of the Anglo-American Council on Productivity covering internal combustion engines was presented. It was agreed that the team's visit to the United States had been as useful as it had proved enjoyable to those participating and their general findings were that production in U. S. diesel factories per man-hour is considerably higher than in England. The most important single factor to account for this difference was considered to be the higher incentives offered to workers in the U. S. In addition the flow of materials into the factories was more highly organized.

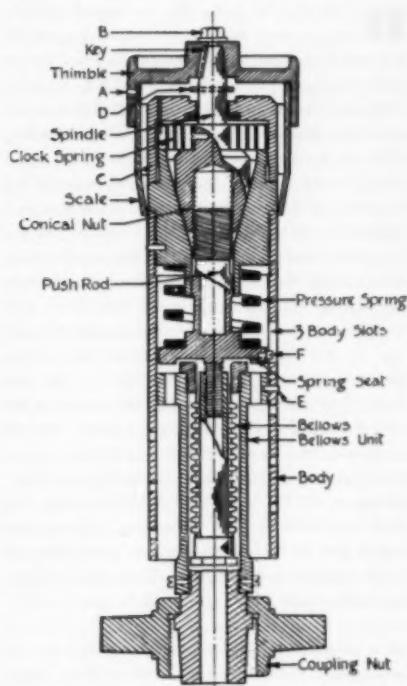
"sure Indicator" for measuring the maximum and compression pressures of internal combustion engines. The instrument is being made under license from Sulzer Bros., the inventors. Engine pressure acts on a bellows and pushes upwards a spring-loaded screwed push rod having a conical nut. A pre-loaded clockspring winds the nut downwards again on to its seat. This process is repeated over a few engine cycles until no further rotation of the nut takes place and the push rod is locked by the nut in its uppermost position. The total angle through which the nut has turned is a true measure of the vertical travel of the push rod and also the maximum gas pressure applied to the bellows—the action is similar to that of a micrometer screw gauge. The pressure is read on a graduated scale marked in any desired units on the rim of a thimble which rotates with the nut. During the first engine cycle after opening the indicator cock, the nut does not have time to lock the push rod in its uppermost position; the cycle of operation is therefore automatically repeated until the movement of the push rod, gradually decreasing, ceases altogether within a few cycles and rotation of the thimble stops. The last increment of movement is only just perceptible and any inertia effect disappears altogether. This results in accuracy of the instrument and eliminates "overshooting"; also it permits a true reproduction of working conditions to be obtained when calibration is done on an ordinary hydraulic type pressure gauge tester. The bellows units will withstand temperatures up to 500°C. and pressures of more than double the maximum firing pressure of the modern diesel. When the peak pressure is reached, the push rod becomes locked in its uppermost position. To reset for repeat readings the thimble is simply turned in a clockwise direction. Otherwise, the indicator is not touched and, as operation is automatic, personal errors of judgment are avoided.

Perkins Ltd. of Peterborough invited the press to visit their new factory, the first stage of which is now in full production. In pleasant countryside surroundings the factory has been planned for the mass production of Perkins standard range of in-

dustrial, marine and automotive type diesels, the output ranging from 50 to 70 bhp. per unit. Working on a basis of a five day week with two 8-hour shifts per day, the daily output of engines has now reached 110 and the scheduled production during 1950 is 25,000 engines, for all of which orders have been accepted. Permission has now been received from the Government to proceed with further extensions to the factory which will double its size and enable output to be stepped-up in proportion. Every facility was given to the visitors to inspect all stages of production and the writer inquired as to the possibilities of successfully running a private car with a diesel instead of a petrol engine. Several cars had been converted and a Nash with overdrive was provided for a demonstration run. This proved most convincing; noise and vibration were not excessive except at very low idling speed. At any speed above 5 mph. the gear box was not required at all and due to the high torque at low engine speed there was an acceleration which seemed unusual to one accustomed to driving an ordinary car.

Perkins appreciate that consideration of the workers' welfare and comfort is an essential towards a high production level and many amenities in the way of sports and social clubs are available which have led to an excellent team spirit. The company's motto, engraved over the main entrance to the factory, reads "Where there is no vision, the people perish."

A new self-propelled earthmover named the "Goliath" has been developed by Blaw Knox Ltd. It is powered by an A.E.C. 6-cylinder direct-injection 4-cycle diesel, rated output 150 bhp. at 1,800 rpm. and embodying a lubrication system which permits the engine to be continuously operated on gradients up to 45 degrees in any plane. At a demonstration, one machine showed itself capable of taking a 20-ton bite of sandy over-burden and transporting this for nearly a mile over rough ground to a dumping point at a speed of 20 mph. The first machines were built for operation in Persia by the Anglo-Iranian Oil Co. Ltd.



Dobbie McInnes Ltd., of Glasgow, are manufacturing a new instrument called the "Peak Pres-



Caterpillar tractor with 'dozer plowing snow from parking area. Rig also used to clear slopes and trails.

## DIESEL-DRIVEN SKI LIFTS

**D**IESEL-DRIVEN ski lifts are rapidly becoming popular for the owners who maintain ski areas during the winter months. Typical of this modernization is Fred Pabst, Jr.'s, Big Bromley, 1,000 acres of slopes and trails nestled within the mountains bordering Manchester, Vermont. Recognized as the East's largest, most varied ski areas, the lifts take skiers from 1,900-ft. altitude to Big Bromley's 3,260-ft. summit. With lift capacity now rated at 2,460 persons per hour moving up the mountain from the base stations, dependable diesel drive was the answer in maintaining the eight hour day during the winter months. More than four years ago, Pabst looked over the mountain trails and decided that here would be the ideal terrain for amateurs and professional skiers—here one would find gentle slopes and trails, as well as the thrill of rapid descent from the 3,260-ft. summit. And, as Pabst looked over the timber studded area, he decided that Big Bromley would be the culmination of all the headaches and hard earned experiences of former years in building a ski area that would give the top ski capacity in the country, and make available to the nation's skiers, lifts and trails that they could enjoy as a winter's sport.

How to go about it? Pabst had the answer. He purchased a Caterpillar diesel D4 bulldozer, felled the timber, bulldozed and blasted rocks along the mountain slopes. His crews began the rugged task of tilting trails correctly, felling timber flush to





One of two Caterpillar diesels used as power for ski lifts.



Another Caterpillar diesel used to power mile-high ski lift.

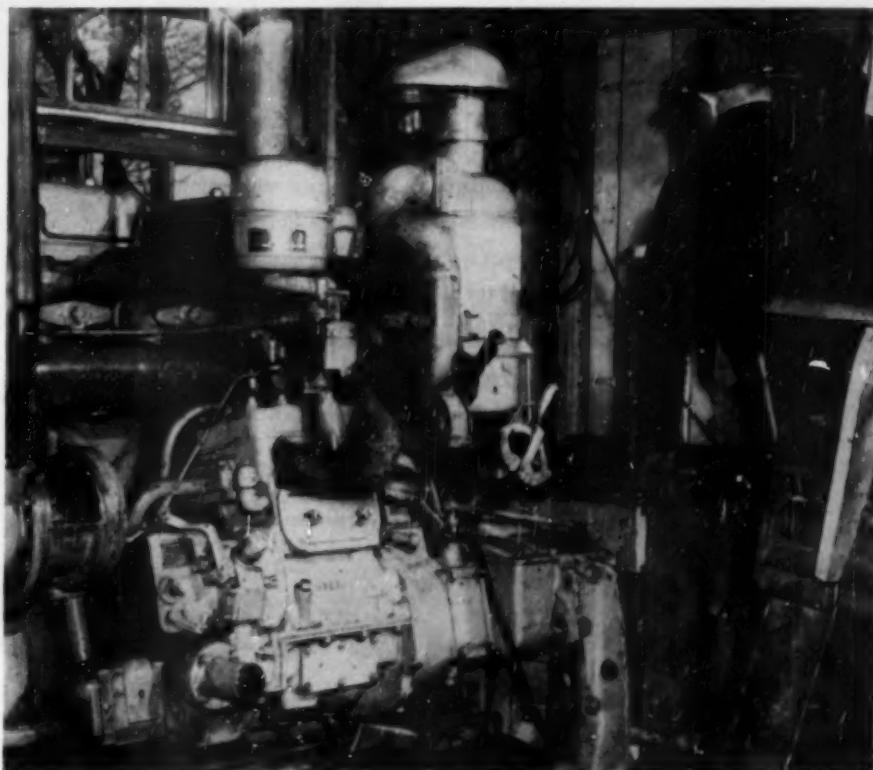
ground so it could be blasted, but here Pabst ran into trouble. He found that this was not the ideal method of clearing the rock laden New England soil, so he went another step further. He changed his method of cutting timber flush to ground and instead cut the timber stumps high, then blasted. After blasting, he ran the bulldozer through, forming carpet-like smoothness over the mapped out trails and slopes. At times, he had to drill the erratic rock formation with compressors, pulverizing the broken stone and bulldozing away. This method worked, and today Big Bromley skiers can attest to a mile-long boulevard, smooth as a baby's cheek and plenty wide for long traverses. This mile run, known originally as the Shincracker Trail and the far western side of the West Meadow, extends from just below the crown of Bromley mountain to the base station. Serviced by two lifts, skiers who do not wish to descend its full length can get off the first lift and ski the run from the West Meadow down.

Bromley's area is serviced by four lifts, each powered by Caterpillar diesel engines. No. 1 has a D8800, which brings 96 skiers up to its 2,700-foot length and 690-foot vertical rise. Its hourly capacity has been figured for 832 people per hour. No. 2 lift, also powered by D8800, keeps 71 skiers moving up its 2,150-foot length and a vertical rise of 570 feet. Lifts No. 3 and 4 are serviced by D315s. The third lift, 1,500 feet long, carries 50 skiers on a vertical rise of 403 feet. No. 4, the smallest capacity lift, can move 48 skiers along its 1,350-foot length and 240-foot vertical rise. All lifts are equipped with Jaybars, and weekend capacity has been tabulated for all four lifts at 3,328 skiers per hour, probably one of the top-up ski capacities in the country. All lift right-of-ways have been filled,

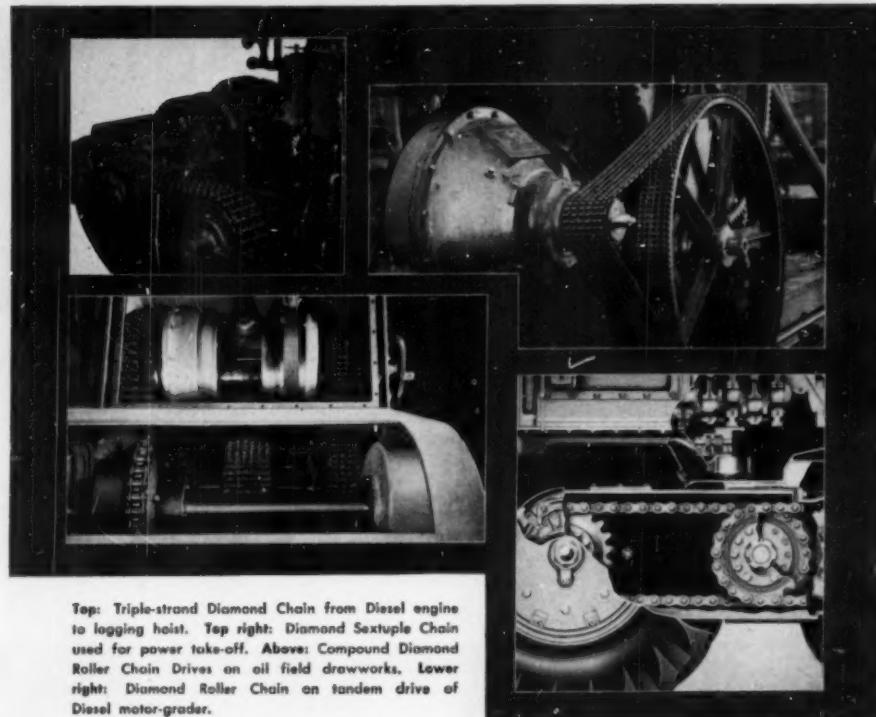
bulldozed and smoothed for the benefit of Bromley's visiting skiers. Perhaps the most interesting fact about the nation's skiers is that they little realize the advent of diesel-driven lifts into one of

Winter's greatest sports—a power that enables thousands of skiers the nation over to enjoy their weekly fun. Big Bromley is just one example of this coming modernization.

Ski resort employee making daily check of "Cat" at top of the lift area.



# IMPROVED POWER TAKE-OFF PERFORMANCE . . . With DIAMOND ROLLER CHAINS



Top: Triple-strand Diamond Chain from Diesel engine to logging hoist. Top right: Diamond Sextuple Chain used for power take-off. Above: Compound Diamond Roller Chain Drives on oil field drawworks. Lower right: Diamond Roller Chain on tandem drive of Diesel motor-grader.

• Diamond Roller Chains are compact—they don't slip and their resistance to stretch and wear means much longer life with minimum attention. Diamond Drives operate equally well on short or long center distances, and high ratios present no problem. Because load is distributed, strain on bearings is reduced for longer trouble-free service.

Our Catalog 709 containing helpful information and data on Diamond Chains will be mailed on request. DIAMOND CHAIN COMPANY, Inc., Dept. 407, 402 Kentucky Avenue, Indianapolis 7, Indiana.

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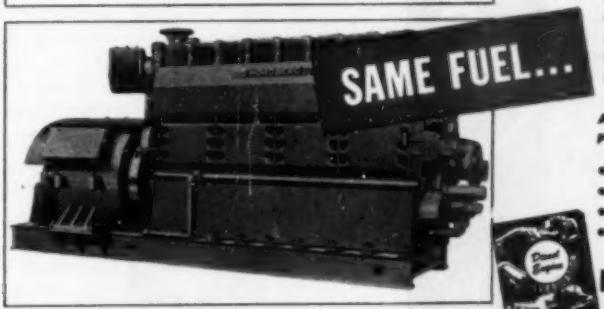
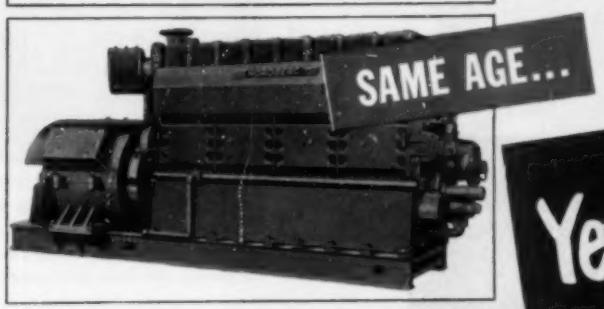
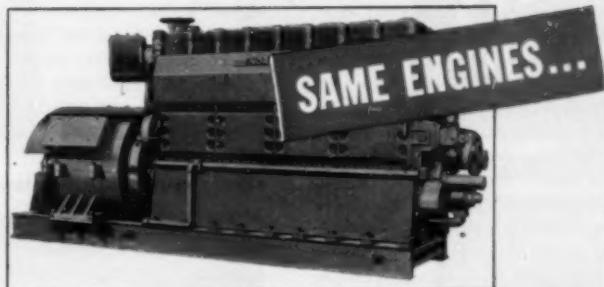
## TEXACO—continued from page 54

Figure 22 shows a comparison between the high gear performance of a popular automobile powered by its conventional 6.6 compression ratio engine and by a TCP engine. Although doing so somewhat minimizes TCP's performance advantages the TCP performance is predicted on using the same bore, stroke and gear ratio as the conventional engine. From Figure 22, it is apparent that the TCP engine will at least equal the full throttle performance of the conventional engine; and that, with normal driving habits, the fuel economy of the TCP engine will be of the order of 30 per cent greater than with the conventional engine. The conventional engine requires a "regular" motor fuel while the TCP engine would operate on a fuel having no octane number specification and a broad boiling range.

At one time or another during the development work TCP engines have been operated extensively on fuels meeting specifications for Motor Gasoline, Diesel Fuel, ANF-58 Jet Engine Fuel, Tractor Fuel, Aviation Gasoline, Navy Special Fuel Oil, et cetera, and it appears that any of these might be used as desired. If a fuel were to be made for TCP engines it should be predicated on maximum yield from crude oil and on minimum processing losses and costs. A clean fuel, of some 100°F. to 600°F. boiling range and having no octane or cetane number specification, would be suitable to the engine and near to maximum availability. As an example, the data presented by Figure 23 has been prepared to show yields of internal-combustion engine fuel obtained in two cases: (1) when manufactured to 1946 commercial gasoline and diesel fuel specifications; and (2) assuming manufacture of a fuel of the type considered for TCP. It will be noted from Figure 23 that there is a significant improvement in the yield of internal-combustion engine fuel in the latter case. An example, such as the above, involves a certain degree of uncertainty as to how far it applies in general practice, and doubtless certain exceptions can be found, depending on the properties of the crude petroleum to be processed and the refinery equipment available for that processing. This particular example was for an actual crude which is in good supply and the processing proposed is that of a large and modern refinery. The example is thought to be indicative of the general situation.

**Summary**—In the foregoing report the theoretical basis of the Texaco Combustion Process has been outlined and typical results have been shown. From this material it is clear that regardless of the octane number of the fuel used, TCP eliminates combustion knock over a broad range of engine operating conditions. Furthermore, TCP can handle fuels of a broad boiling range and it can burn very lean mixtures with the result of a high part-load efficiency and of load control by fuel quantity alone. The conditions to be met for TCP operation and the permissible tolerances on these conditions were investigated and found to be commensurate with the requirements for construction, servicing and use of engines. The requirements for high efficiency of engine operation also were outlined and the progress that has been made in this direction was illustrated by comparison of TCP thermal efficiencies with those of Otto and Diesel cycle engines. On a relative efficiency basis TCP is not yet as well developed as the other engine types. However, its value appears to depend less on results obtainable from future development than on what is already at hand, namely, that it combines in a single operation the best characteristics of Otto and Diesel cycle engines without introducing the fuel quality requirements of either. In a predictive glimpse at car performance and the availability of internal combustion engine fuels, it appears that TCP type of engines can yield a minimum of 30 per cent more miles per gallon—30 per cent more gallons per barrel.

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## Ohio Diesel Builder Develops New Supercharger

Large capacity engine superchargers are now being built by The Cooper-Bessemer Corporation at its plant in Mount Vernon, Ohio. Designed specifically for Cooper-Bessemer type LS and LSV engines, the new superchargers are of such size and design as to handle the requirements of any gas or diesel engine from 1,200 hp. to 2,500 hp., according to Ralph L. Boyer, Cooper-Bessemer vice president and chief engineer.

"Cooper-Bessemer's decision to manufacture engine superchargers results from its inability to secure superchargers of such large size in this country," explains Mr. Boyer. A leader in the

development of engine supercharging, Cooper-Bessemer's experience with exhaust driven superchargers dates back to 1935, when such superchargers were first introduced in this country by a European manufacturer and installed on Cooper-Bessemer equipment. Since that time, every effort has been concentrated on the design of both engines and superchargers to achieve the ultimate in engine output and efficiency. To this end, Cooper-Bessemer has engaged the services of John Fullerman, internationally recognized authority on supercharging. The supercharging of engines is one of the most effective means of increasing engine power output without increasing the size or speed of the engine. Supercharging is, of course, used widely on aircraft engines and other places where weight is of prime importance. Through

increasing the intake or manifold pressure of an engine by means of a blower or supercharger, it is possible to inject and burn more fuel in the cylinder and so boost the output as much as 100 per cent, depending on the type and design of engine. Supercharging is now used extensively in the heavy gas engine and diesel fields, in engines for locomotive service, inland and ocean going vessels as well as on cross country pipe line projects like the new Mid-Valley Pipe Line and in electric power generating stations.

## New Fireboat for Houston, Texas



The *Captain Crotty*, a new diesel-driven fireboat for the Port of Houston, was launched recently at the R. T. C. Shipbuilding Co., Camden, New Jersey. Named for a former assistant director of the Port of Houston, the *Captain Crotty* will carry a two-fisted punch for the quick annihilation of fires in the shipping or within a quarter mile of Houston's shoreline. Besides a 6,000 gallons-per-minute water-pumping capacity, the ship will carry 1,000 gallons of "liquid foam" which, when mixed with water in special nozzles, will throw out a 160,000 gallon fire-smothering chemical blanket in 20 minutes.

Propulsion power and pumping power for the *Captain Crotty* are both supplied by the "Quad-6" G.M. diesel engine. By shifting hydraulic clutches, all four engines which make up the "Quad-6" unit may be used for pumping or any combination of from one to four engines may be used for pumping or for propulsion. The result is extreme flexibility, the ability to maneuver while pumping or to devote her entire 800 horsepower to the task of getting to the location of a fire in a hurry.

## Appointment at Marley Co.



Jim C. Chase has been named manager of the recently expanded DriCooler sales department of The Marley Company, Inc. He has been located at the general offices in Kansas City, Kansas, since joining the company late in 1948. Before coming to The Marley Company,

he was the Southwest district manager for the Aerofin Corporation, working out of Dallas, and before that had been a lieutenant in the Navy, doing salvage and repair work.

Although born in Dallas, Texas, Chase lived in Louisville, Kentucky, until he reached college age. He received his degree in mechanical engineering from Purdue University, Lafayette, Indiana. He is married and has a 5-year-old son.

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## President of Federal-Mogul Corp.

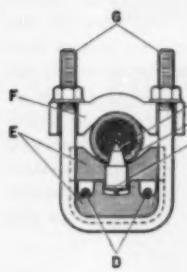


Guy S. Peppiatt

The board of directors of Federal-Mogul Corporation announce the following change in executive organization. H. Gray Muzzy, who has served as president, becomes chairman of the board. Guy S. Peppiatt, executive vice president, was elected president.

H. G. Muzzy has served as president for 21 years, having assumed the position in 1929. During his administration the company, which is a leading producer of engine bearings and related products, has expanded from an organization with a single manufacturing plant and nine service branches, with annual sales of approximately \$5,000,000 to one with seven manufacturing plants, 63 service branches throughout the United States and Canada and an extensive export representation. The current sales are at an annual rate in excess of \$20,000,000. As chairman of the board, Mr. Muzzy will continue in an active executive capacity. G. S. Peppiatt, who becomes president, has been with the company for 22 years, serving in various positions, and since 1945, as executive vice president.

## A New Quick Connector

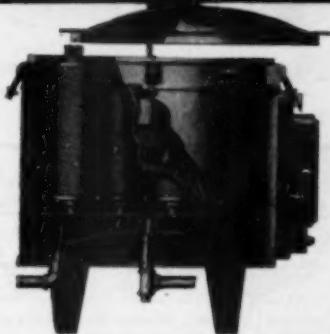


Gemmer Manufacturing Company announces a new electrical connector, the "Snaptap," which cuts to a fraction the time needed for making branch connections. As the "Snaptap" also usually eliminates the need for panel boxes, savings in cost of branch connections are substantial. "Snaptap" is safe to use in connecting to hot lines. The connection is made without stripping the main line insulation or exposing the copper. "Snaptap" accommodates 350,000 to 800,000 circular mil cable—No. 14 to No. 6 branch wires.

As may be seen in the drawing, "Snaptap" is a simple device. The solid copper piercer pin (A), inside the "Snaptap," pierces the cable insulation at (B), making a very small hole. The end of the pin meshes with the strands of the cable, forming a reliable electrical connection which is completely enclosed and protected against oxidation.

The other end of the piercer pin has a rounded bead (C) which presses against the stripped end of the branch wire, so you have the whole branch connection at once—no soldering. (D) shows the branch wire, coiled in the spiral groove which anchors against pull out. If the "Snaptap" is removed, only a small hole is left in the cable insulation which is easily covered by a few turns of tape. Additional information may be had by writing DIESEL PROGRESS, File 36, P. O. Box 8458, Los Angeles 46, Calif.

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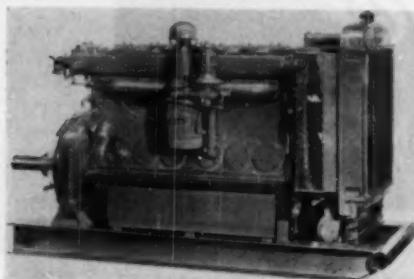
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**Murphy Diesel Announces Dual-Fuel Engine Line**



A new line of heavy-duty engines, power units

and generator sets capable of burning either natural gas or diesel fuel has recently been announced by the Murphy Diesel Company. Employing the same basic construction as Murphy diesel engines, the new Murphy dual-fuel engines permit operation on either fuel merely by positioning a simple lever for the desired fuel. On either fuel no further adjustments are necessary. According to the manufacturer, the Murphy, unlike most gas engines or gas conversion engines, is a heavy duty engine utilizing the economical advantages of high compression combustion.

Gas is fed to the engine through the air cleaner and intake manifold at substantially zero pressure.

The vacuum of the engine delivers a full charge of air every intake stroke and the hydraulic governor controlled gas valve admits just the correct amount of gas to deliver the horsepower required. It is claimed this system insures a lean economical mixture of air and gas always with an excess of air. Ignition is accomplished by injecting pilot diesel fuel into the cylinder. The heat of compression ignites the gas-air mixture. A constant small quantity of pilot fuel is used (not over 14 per cent for extreme operating conditions).

If operation as a full diesel is desired for continuous diesel service, this change can be made without any additional parts. In areas where natural gas is available, it is estimated that fuel savings up to two-thirds over diesel operation can be achieved. For areas where gas is not now available, Murphy dual-fuel engines can be operated as full diesels for the present and immediately switched over to gas when it becomes available. Three models are now available, ranging from 135 to 180 hp. Full details and descriptive bulletin No. 107 are available from the manufacturer.

**National Carbon Announces Standard Carbon Brushes**

A distinctly new method of merchandising carbon brushes is announced by National Carbon Division, Union Carbide and Carbon Corporation, in the establishment of "National" Carbon Standard Brushes. This radical move insures not only a better product, at a better selling price, but also an adequate stock at all times for prompt shipment, thus providing a very real saving to the purchaser. The standard brushes in the list include some of the most popular items for diesel-electric locomotive service; P.C.C. car motors; Westinghouse SK motors and generators; Westinghouse motors and generators having tandem holder; and General Electric CD motors and generators.

These standard brushes, to be sold at a flat price, are those in such demand that they can be produced in large quantities, packed in standard packages, at the same price per brush regardless of the quantity purchased, provided they are purchased in standard package quantities or multiples thereof. The standard packages, in lots of 50, 100 and 250 brushes, dependent on type of brush, are designed for convenient handling in stores and shipment. Grades, shunt connections and other specifications for each standard brush have been carefully studied to provide the most satisfactory general performance, the widest latitude of application and the lowest consistent selling price.

**Packless Expansion Joint Bulletin**

New 16-page bulletin No. R-35-51 explains design and construction of *Corrflex*, ADSO's corrugated packless expansion joint that requires no maintenance. Complete description of line includes sizes, temperature and pressure ratings, dimensions and weights. Simplified selection charts make it easy to determine proper joint for most applications. Recommended installation practice is summarized together with pertinent engineering information. Illustrated with photos of types, cutaway view and typical installations.

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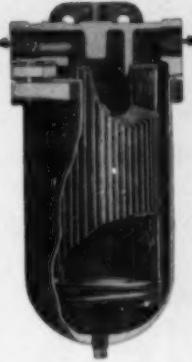
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Export Sales: Bendix International Division, 72 Fifth Ave., N.Y. 11, N.Y.

### All Steel Welded Diesel Vessel



The above photograph shows one of three "Equity"

ty" 42-foot 6-inch shallow draft diesel towboats of all steel welded construction recently shipped to the Belgian Congo. This "Equity" standard special service towboat is one of many such vessels the Equitable Equipment Company, Inc., of New Orleans, has built since the first one produced way back in 1921. This vessel is really a special service boat drawing only 15 inches of water. The beam is 11 feet 1 inch, and the molded depth 2 feet, 5 inches. The shell plating is 3/16-inch steel; cabin, sides and deck plating is 10-gauge, with the cabin top of 12-gauge. The hull framing is longitudinal, with angle space of 16-inch centers. There is a watertight bulkhead, 10-gauge steel at the forward end of the deck house.

The GM 471 107-hp. diesel engine with hydraulic shift and finger tip control at the operator's station makes this a one-man boat. Electric starting and fresh water cooling is built in. Completely outfitted and equipped, this vessel seats approximately 15 or 16 passengers in the cabin.

### New Air-Pressure Greasing System



An easily installed, centralized lubrication system that will bring modern "service station" greasing convenience to drilling rigs has been developed and produced by Aeroquip Sales & Engineering Incorporated. The new air-pressure greasing system, known as AEROLUBER, can be assembled for any type installation and is designed for effective

use at any point where there is a concentration of machinery. Typical installation for a rotary rig includes two spring loaded reels, each with 50 feet of Aeroquip hose, hose fittings, grease fittings and grease control valve with pressure controls to eliminate danger of bursting bearing seals. To make the system dirt proof and prevent lubrication contamination, the AEROLUBER incorporates an Alemite "Atomic" lubricant pump flanged to a drum head that fits any standard 100-pound grease drum. In operation the drum head is fastened to the container and is not removed until it has been completely emptied. The pump may be located in any convenient place, and the reels mounted on the drawworks header board or to any other portion of the rig where they will not interfere. Any air source affording 80 to 150 pounds pressure can operate AEROLUBER. The new system is designed to assure maximum efficiency and economy in operation and to provide greater operational safety. The waste involved in the use of a hand or pedal operated gun is eliminated and a more effective job is attained with AEROLUBER. For additional information, write DIESEL PROGRESS, File 35, P. O. Box 8458, Los Angeles 46, California.

### ADEQUATE SILENCING

BUILT  
INTO A  
SINGLE  
UNIT . . .

A single silencer outside and only the exhaust piping inside - a space saving installation - and a flexible one because exhaust can be run high, low, or underground with the Maxim Air Induction Silencer. The inlet can be placed where you want it. Hot air is drawn out of the engine room, and piping and silencer are both cool so that paint will stay on. Investigate this most practical way to get adequate silencing and engine room ventilation.



SEND FOR THIS BULLETIN



THE MAXIM SILENCER COMPANY  
94 HOMESTEAD AVE., HARTFORD 1, CONNECTICUT

Please send AIR JACKETED SILENCER bulletin.

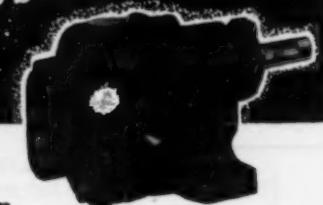
NAME \_\_\_\_\_

COMPANY \_\_\_\_\_

ADDRESS \_\_\_\_\_

BE SURE IT'S A  
**MAXIM**

## Efficient, Economical Pumps...



for Diesel  
Lubrication

Brown & Sharpe general purpose Rotary Geared Pumps, because of their compactness and efficient operation, are ideal for diesel lubrication.

A wide selection of Brown & Sharpe Rotary Geared Pumps makes a wise selection possible. Models available — Nos. 1, 2, 3, 4, 1S, 2S, 3S, 11, 12, 13. Reversing or non-reversing types. Self-lubricating. Range of capacities from 1.6 to 27 gpm. Brown & Sharpe Mfg. Co., Providence 1, R. I.

We urge buying through the Distributor

**BROWN & SHARPE**

**NEW**

# Sheppard

## DIESEL replacement engine

Cuts Fuel Bills in Half  
... and then, in HALF AGAIN

$\frac{1}{2} \times \frac{1}{2} = \frac{1}{4}$

The Fuel The Price

Sheppard 6M Diesel ready to install

### Saves Over 75% on Fuel Costs

The New Sheppard 6M FULL diesel fits any machine originally powered with an International 6 series gasoline engine . . . without any alterations to mountings or frame. Also fits the Farmall "M" farm tractor as well as the MV; W6; O6; OS6; 16; T6 and the U6 power unit. Write today for free literature and complete information.

**SHEPPARD DIESELS** • Hanover T, Pa.  
Builders of the Famous  
Sheppard Diesel Farm Tractor

POWER UNITS: 3 1/2 TO 100 H.P. GENERATING SETS: 2 TO 36 K.W.

## DIESEL USERS!

Here's how FRAM FILTERS  
can save you money . . .

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Telephone 910

UNITED FISHERIES COMPANY  
Distributors for Provincetown Mass.  
401 Main Street  
Gloucester, Massachusetts

November 15, 1948

Fram Corporation  
Providence 16, R. I.  
Gentlemen:

"I have installed Fram Filters on the lubricating and fuel systems of my fishing boat, 'Paul Howard.' Engine is rated at 425 horsepower. "Before using Fram, engine and parts would get caked with sludge . . . often causing engine trouble. "Now, I find oil and engine unusually clean. Fram Fuel Oil Filter removes dirt and scum before it reaches injection system. "One set of cartridges good for 1000 to 1200 hours before oil starts to darken. Fram Filters have done a job far above my expectations. Pleased to recommend them."

Very truly yours,  
UNITED FISHERIES VESSELS CO.  
By: *Paul Howard*

### FRAM Can Help You!

No matter what your Diesel oil filtering problem—fuel or lube—Fram can help you conquer it. Let Fram's Research Department help you by determining what Fram Filcron Oil Filter you need for keeping injectors clean and efficient . . . keeping vital moving parts free from the damage caused by dirt, dust, grit, sludge and abrasives.

Save money, time on overhauls, breakdowns, the Fram Filcron way. Write today to Fram Corporation, Providence 16, R. I. In Canada: J. C. Adams Co., Ltd., Toronto, Ontario.

**FRAM**  
**Filcron**

THE MODERN OIL FILTER



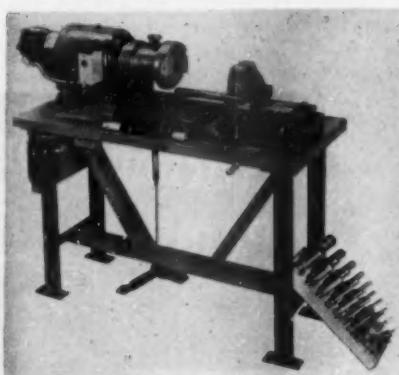
## New Bulletin by Nordberg

Publication of a 16-page, two-color bulletin on Nordberg Type FSM-16 4-cycle, direct reversing, 16-inch marine diesel engines is announced by Nordberg Manufacturing Company. Built in 6, 7 and 8-cylinder sizes of 16-inch bore and 22-inch stroke, the FSM-16 is of the trunk piston, mechanical injection type. It is designed for non-supercharged or supercharged operation. At 327 rpm., this Nordberg diesel engine develops from 875 hp. for the 6-cylinder non-supercharged engine to 2,100 hp. for the 8-cylinder supercharged unit. Higher ratings are available by intercooling and high pressure supercharging. These engines are supplied for direct or reduction gear

drive or electric propulsion in single or multi-unit installations.

Bulletin 176 illustrates with photographs and machinery arrangement drawings some typical successful installations. Included in the bulletin is a schematic arrangement showing pressure lubrication to working parts, a cross section through the power cylinder and drawings showing the engine dimensions for the various engine sizes. Streamline appearance, simplicity, improved operating economy, rugged construction and easy accessibility to all working parts are other features of the Nordberg Type FSM-16 marine diesel engine described in the bulletin. This bulletin is available free upon request.

## Hose Line Assembly Machine



Aeroquip Corporation, manufacturers of flexible hose lines with detachable fittings, has now available a hose assembly machine for large users of their hose lines. While Aeroquip hose lines may be hand assembled, the Aeroquip Assembly Machine, Model No. F-1766, will enable large users to make up their requirements of specific lengths of hose lines on a short notice and on a production basis up to 600 per cent faster than by hand assembly. It is claimed that any mechanic after a brief indoctrination will be able to operate this assembly machine at its maximum efficiency. The assembly machine will accommodate all types of standard Aeroquip fittings, including male pipe, swivel, flange and elbow type, allowing for greater use of bulk hose and fittings, resulting in increased savings due to reduced inventory of factory assembled hose lines. The Aeroquip assembly machine will further permit quick salvage of large stocks of hose lines that cannot be used for one reason or another.

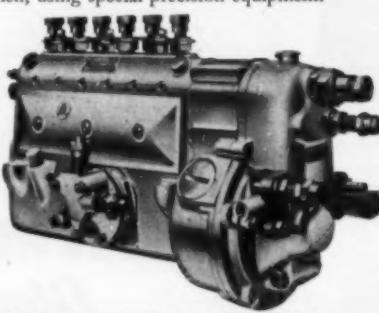
## Confidence Abroad



*Transport operators all over the world have learnt to trust this sign.*

In any language the letters on the C.A.V. sign stand for first-rate service facilities, maintained by highly-trained craftsmen, using special precision equipment.

Wherever vehicles fitted with C.A.V. Fuel Injection Equipment are exported — whether to Trondheim, Santiago, Hong-Kong or Sydney — there's a service agent or depot to give it the specialist attention needed for such high-precision equipment.



## Fuel Injection and Electrical Equipment

*Service Depots throughout the World*

C.A.V. DIVISION OF LUCAS ELECTRICAL SERVICES INC., NEW YORK 19, N. Y.

Sales Office:  
14820 DETROIT AVENUE, CLEVELAND 7, OHIO

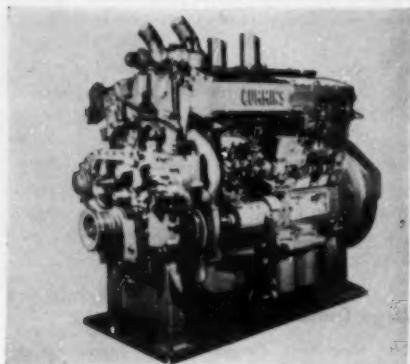
## Joins Cuno Engineering Sales Staff



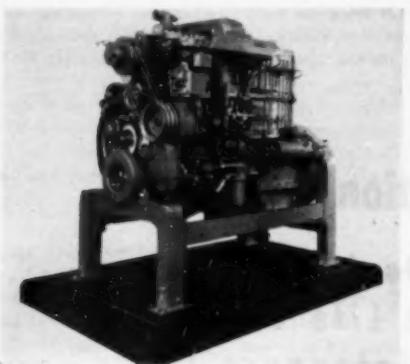
The Cuno Engineering Corporation in Meriden, Connecticut, has announced the appointment of J. R. (Swede) Carlson to its sales staff. Carlson's immediate project is to assist Cuno Engineering representatives in serving the diesel manufacturer and user. It is this company's objective to make the results of its quarter century of filter engineering experience more readily available to the diesel engineer. The continued growth of the diesel industry, the complexity of the filter applications, and the advent of new Cuno models, including Micro-Klean, have all combined to create the need for a full time engineer to further the Cuno Engineering service objectives.

Carlson is no stranger to the diesel field or the problems connected with it. He was graduated from the U. S. Naval Academy and served a "hitch" in the Navy. He was connected with the diesel division of Worthington Pump and Machinery Company for a dozen years. Part of this period he was in the engineering division in Buffalo and later handled the sale of Worthington diesels in the field.

### Cummins Exhibit at Metal Mining Show



Three activated cutaway Cummins diesels emphasizing the broad range of horsepower of these lightweight highspeed diesel engines will be featured in the Cummins exhibit at the 1950 Metal Mining Exposition in Salt Lake City, August 28-31. These engines will include the new 150-hp. Model JS-600, the 300-hp. Model NHRS-600, and the 550-hp. Model NVHS-1200 Cummins diesels. Each of the cutaways has been sectionalized to show the internal structure and operation of the engines, including the exclusive Cummins fuel system, the new DD (double-disc) type fuel pump:



cylinders and liners, valves, pistons, supercharger and supercharger drive, gear train, water pump, oil cooler, lubricating oil pump, oil pan, crank-shaft; and the four cycle principle of operation. All portions of the engines that have been sectionalized have been replaced with lucite, and the engines are internally lighted and activated. All three engines in the Cummins display will be equipped with the completely new DD (double-disc) Cummins fuel pump. This new pump is a further refinement to the time-tested and exclusive design features of the exclusive Cummins fuel system.

### Fulton Iron Works Situation

There has been so much misinformation spread throughout the industry regarding the immediate future of the Fulton Iron Works Company of St. Louis, Mo., that we asked Mr. F. E. O'Neil, president of Fulton Iron Works Company, to clarify the situation, and herewith is a direct quotation from Mr. O'Neil:

"Recently the management found it expedient to get rid of certain machine tools in our shops

which were considered surplus. As was expected, this led to certain rumors to the effect that the company was discontinuing all manufacturing operations. To paraphrase Mark Twain, the rumors were highly exaggerated. Actually, the company will continue operations here, as in the past, fabricating in its own shops, and with its own personnel, orders received covering complete diesel and dual fuel engines or spare parts thereof. The same exacting supervision and control by our experienced technicians continues without interruption. Our unexcelled engineering and service departments will continue to cooperate with our clientele to solve any problems that

might come up and recommend remedies for situations that require such attention. The customary FULTON guarantee of quality, labor and materials will apply in the future as it has through the past 98 years of successful operation. Needless to say, Fulton would be grateful to receive any of your inquiries for complete diesel and dual fuel engines or spare parts thereon."

The editors pass this statement of Mr. O'Neil's on to you, our readers, in order to clarify a situation which was proving embarrassing not only to Fulton Iron Works Company but to many of their old users.

## Fountain of Youth...



Ponce de Leon found Florida on Easter Sunday, 1513. He was looking for a legendary island called Bimini, where he could restore his youth and vigor in a magic Fountain of Youth.

## for DIESEL Liners

Had he found what he was looking for, old Ponce de Leon would be one of our customers today. He'd have been quick to see VANDERLOY M and PORUS-KROME,<sup>\*</sup> as a veritable "Fountain of Youth" for diesel liners. Even liners ready for the scrap pile get back their original size in a way that makes them work better, last much longer and lets them be renewed again and again.

Now that's just what the old Spanish explorer wanted for himself. Worn to a nub, from sailing with Columbus and then working up to govern the Indies, about all he had left was the courage of his convictions. But he let himself be convinced by a legend. You, of course, want only facts. The kind the Van der Horst process has been piling up, in thousands of hours of actual service, prove that diesel liners need never wear out. Why not take advantage of this way to cut your operating costs? We'll gladly show you how—today.

\*PORUS-KROME is a dense, hard, wear and corrosion-resistant chromium, produced by the Van der Horst Corporation of America, and which gives working surfaces an infinite number of tiny oil-retaining reservoirs for perfected lubrication.

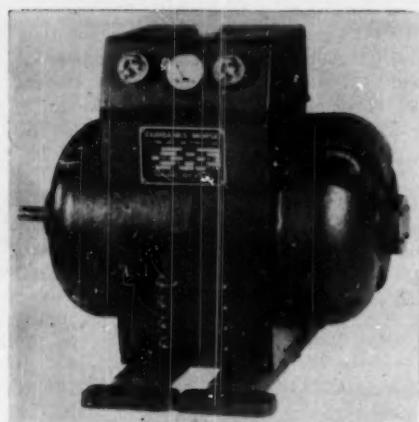
VAN DER HORST CORPORATION OF AMERICA • OLEAN, N. Y.  
U. S. PATENTS 2,046,570, 2,314,604 and 2,417,698

## PORUS - KROME

*Good for the Life of your Engines*

VAN DER HORST

## F-M Announces New Belted Generator



A new low priced generator that can be belted to any available power unit or tractor whenever power is needed in case of high line difficulties or failures, or for service in remote areas, has recently been announced by Fairbanks, Morse & Co., Chicago manufacturers. These generators are furnished in two sizes, 3 and 5 kw., and are specially designed for this particular type of service. They are of the four-pole, self-excited type designed for operation at 1,800 rpm., 60-cycle, 120 volts, which is the same frequency and voltage delivered by the high line.

These new generators, which are produced in the

company's Clinton, Iowa, Works, have a number of features incorporated for the special service for which they are designed. For instance, type HF synthetic enameled wire is used in the winding of both the armature and field coils, and the wires are further impregnated with insulating varnish, oven-baked. All windings are finally covered with Glyptal to make them completely moisture-proof. Ventilation openings are screened as a protection against mice, rodents or snakes which might be attracted to a warm housing space, as these generators will probably be left out in the fields where they are used. The frame of the generator is of drip-proof construction for service when exposed to the weather. Two Twistlock receptacles are furnished with the 3 kw. units and three with the 5 kw. units. A convenient slide rail also makes it possible to adjust the belt tension after the tractor or power unit has been spotted in place.

### Appointment at Electric Auto-Lite

Toledo, Ohio.—Appointment of Donald B. Seem as advertising manager of The Electric Auto-Lite Company was announced recently by Royce G. Martin, president and board chairman of the company. Mr. Seem has been associated with Auto-Lite since 1947, when he became assistant advertising manager. Prior to coming to Toledo, Mr. Seem was advertising manager of The Frostilla Company, Elmira, New York, and previous to that was with the Aitkin-Kynett Company, Philadelphia, Pa. He is a graduate of the Wharton

School of Finance and Commerce of the University of Pennsylvania and during World War II served as a lieutenant in the United States Navy.

In his new post, Mr. Seem will direct the large scale advertising program of Auto-Lite in consumer and trade magazines, newspapers and all other media, including the company's top rated "Suspense" program aired each week over the radio and television networks of the Columbia Broadcasting System. Advertising agencies handling the Auto-Lite account include Ruthrauff & Ryan, Inc., and Cecil & Presbrey, Inc.

### Large Diesel-Electric Order

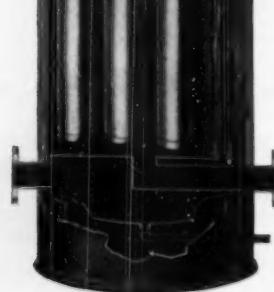
The New York Central System announced recently orders for 21 road and yard switching diesel-electric locomotives to cost approximately \$2,600,000 for service on its affiliated Peoria & Eastern Railway. With delivery of this order, scheduled before the end of the present year, dieselization of all operations of the Peoria & Eastern will be accomplished. The railway operates over 211.5 miles of line between Peoria, Ill., and Indianapolis, Ind.

Ordered from the Electro-Motive Division of General Motors Corp., the locomotives are divided fourteen 1,500-hp. road switchers and seven 1,200-hp. yard switchers. The newly-ordered locomotives will bring the total diesel-electric horsepower on the New York Central and affiliated railroads to 1,156,000, comprising 1,019 units of power.

## Specify HONAN-CRANE



In this plant Honan-Crane Purifiers are direct connected to twenty-four 1,000 HP Cooper-Bessons; nineteen 1,000 HP Worthingtons and eleven 1,450 Rathburn Jones engines . . . a total of 68,950 HP.



Honan-Crane Purifiers are available with both single and multiple cartridge-type, quick-change media . . . using either calcium silicate or Fuller's earth purifying media.

## Oil Purification for DIESELS

### Proven Design Increases Safe-Use Life of Oil . . . Cuts Maintenance Costs

Honan-Crane Oil Purifiers are the choice of leading Diesel operators and engineers for purification of lubrication oils in Diesel Engines.

Honan-Crane purifiers remove abrasives, acids, sludges and all other types of damaging contamination . . . give maximum protection against bearing failure . . . extend safe-use life of oil, thereby reducing the need for frequent oil changes. Design characteristics of Honan-Crane Purifiers have been tested thoroughly for many years under all kinds of operating conditions.

On-the-job performance has proved that the best saves you most in the long run. Give your diesels the finest protection you can buy . . . specify HONAN-CRANE.

For complete information (or, a Honan-Crane resident engineer will call at your request) . . . write to Honan-Crane, 202 Indianapolis Ave., Lebanon, Indiana.

**HONAN-CRANE CORP., Lebanon, Indiana**  
Subsidiary of **HOUDAILLE-HERSHEY CORP.**

## New Design Utility Boat



A new design utility boat which puts the emphasis on high speed, comfort and dependability has been announced by Platzer Boat Works, Houston, Texas. Powered by a Model 6-71 General Motors diesel engine, the Platzer Boat marked up an official speed of 25.6 miles per hour with a full complement of fuel and passengers over a government measured course. It is the first all-steel full diesel driven utility boat of its type with a speed of 25 actual miles per hour ever built on the Gulf Coast.

Constructed entirely of Mayari-R steel, this new Platzer boat combines remarkable speed with simple, clean-cut construction and the best power-weight ratio of any boat in the water, the manufacturer said. It has four water tight compartments. The exterior is metallized with zinc and the interior is sound insulated. The present model is 30 feet long and 10-foot beam and seats eight passengers in the cabin. The design was developed specifically to meet the demand of oil operators for a fast, dependable utility boat for gauging, standby and crew transportation work.

## Sales Training for Fram Personnel

Fram Corporation, Providence, Rhode Island, manufacturer of automotive oil, air and fuel filters, this year inaugurated a new type of sales training course for district managers. Concentrated within two weeks, the course, designated as the Fram Institute of Filtration, incorporated a thorough review of company products, policies, marketing and distribution, advertising, merchandising and selling techniques. District managers were divided into three groups and the two-week course repeated for each group. Thus, every man in turn was brought in from the field for the institute, without noticeable interruption to normal activities in the corporation's over-all operation.

Under the direction of Malcolm McCormick, vice president in charge of market research, who planned, coordinated and executed the program, the teaching staff included Dr. William S. James, vice president and director of engineering research; Paul Huber, chief research engineer; H. G. Kamrath, chief liquid filter engineer; other members of the engineering staff; Howard E. Robinson, sales manager, and members of his staff. C. M. Buchanan, vice president of VanSant, Dugdale & Company, Fram's advertising agency, conducted a session on advertising; and Donald McKellar, of Providence, gave a course in public speaking and salesmanship.

## Represents Lima-Hamilton

Lima-Hamilton Corporation has appointed The Power Equipment Company of Kansas City, Mo., as representatives of the firm on the sale of the new Hamilton 21½-inch by 27½-inch diesel engines in western Missouri, and in Arkansas, Oklahoma, New Mexico, Kansas, Colorado, Iowa, Nebraska, Minnesota and North and South Dakota. The Hamilton diesel, which is becoming popular throughout the country, is a 2-cycle engine with 21½-inch bore and 27½-inch stroke, available for stationary service. It can be arranged for dual-fuel operation, with fast, easy changeover from gas to oil, and oil to gas.

## Seaboard Uses More Diesels

Seaboard Air Line Railroad has placed orders for sixty additional diesel locomotives, lifting the road's ownership to 329 diesel units and making possible for 1950 dieselization of 81 per cent of its freight service, 88 per cent of passenger service, and 56 per cent of yard switching. Leigh R. Powell, Jr., president, announced recently. The additional power will cost about \$8,000,000 and will be built by Electro-Motive Division of General Motors Corp., Baldwin Locomotive Works and American Locomotive Co. To complete dieselization of the entire Seaboard will require purchase of 140 to 150 more diesels at some future time.

# "It's A Gift!"

## \$3600 in savings

Le Page's, Valley Stream,  
L. I., auto service mecca  
for motorists.

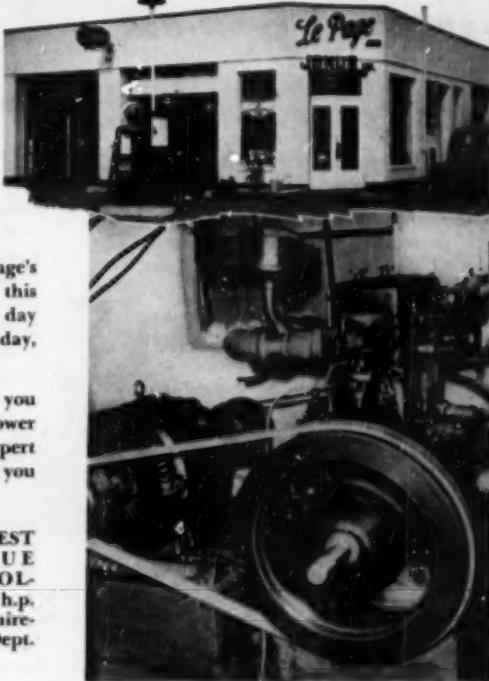
During ten years their LISTER-BLACKSTONE has put \$3,600 in savings in Le Page's pockets. "It's a gift!" says Mr. Le Page.

Ten years of providing total power requirements for lights, heating, air compressors and bench machines at Le Page's modern, fully-equipped service station is this engine's record. That means 24 hours a day on cold days, 13 hours a day every week day, half a day on Sundays.

Let Lister-Blackstone show YOU how you can make comparable savings in your power requirements — at no obligation. Expert Lister-Blackstone engineers will furnish you with detailed recommendations.

Reduced  
Prices!

GIVE YOU BIGGEST  
DIESEL VALUE  
FOR YOUR DOL-  
LAR! 5 to 480 h.p.  
Write us your require-  
ments. Address Dept.  
DP.



Le Page's Model 10-2 Lister-Blackstone Diesel

# Lister-Blackstone

LISTER-BLACKSTONE, Inc.

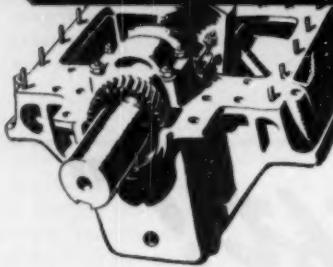
Factory, Sales & Service Headquarters: 420 Lexington Avenue, New York 17, N. Y.

Parts Warehouses: NORFOLK, Va. 109 Strand Street; BOSTON, Mass., Whoso Bldg., Fish Pier

Agents in: Boston • New York • Norfolk • New Orleans • Mobile • Tampa • Miami • Jacksonville • San Antonio • Dallas • Houston  
Newton (Iowa) • Seattle • Los Angeles • San Francisco • San Diego • Montreal • Toronto • Winnipeg • Vancouver

Sold and Serviced in 37 Countries Throughout the World

## EXPEDITE OVERHAUL



*with specialized  
Oakite cleaning  
compounds & methods*

**L**OOKING for a way to cut hours off your overhaul schedule? Try cleaning parts the rapid, economical Oakite way.

Oakite cleaning materials and methods are deliberately designed to remove heaviest accumulations of sludge, oil, scale. Their detergent action is so thorough, so quick that inspection of parts preceding overhaul becomes simple and certain. Your mechanics can see at a glance what needs to be done—and waste no time doing it!

### *Speed these jobs, too —*

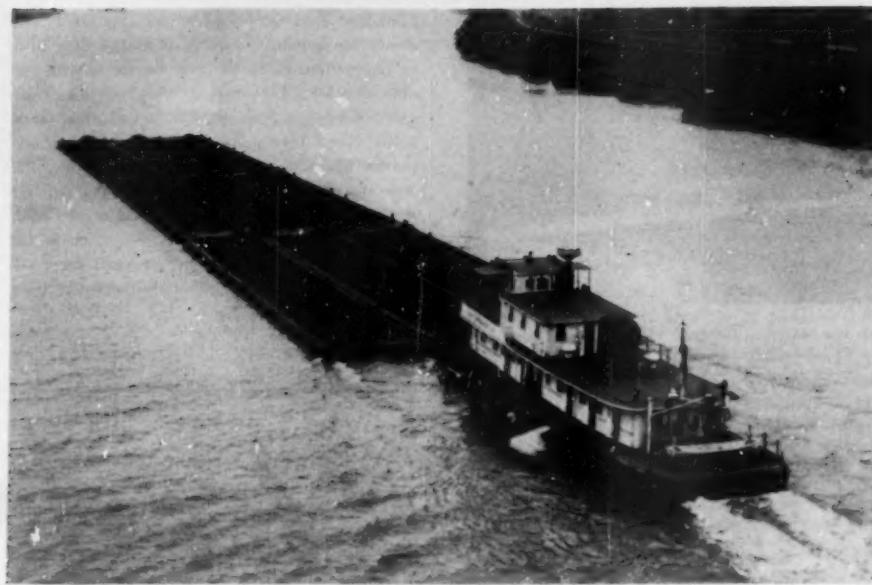
- Conditioning heat exchangers
- Cleaning feedwater heaters
- Descaling surface condensers
- Paint-stripping
- Descaling compressors
- Cleaning fuel oil tanks
- Renovating painted surfaces

FREE illustrated booklet tells how Oakite materials speed cleaning all types of Diesels. Write today to the address below. No obligation.

SPECIALIZED INDUSTRIAL CLEANING  
**OAKITE**  
MADE IN U.S.A.  
MATERIALS • METHODS • SERVICE

OAKITE PRODUCTS, INC., 220 THOMAS ST., NEW YORK 6, N.Y.  
Technical Service Representatives in Principal Cities of U.S. & Canada

## Five New Diesel-Driven Towboats



Modern diesel towboat of approximately the same class as five new boats Dravo Corporation will construct.

**F**IVE new modern diesel-powered towboats are going to be added to the fleets of river vessels in the Pittsburgh district, replacing picturesque but obsolete stern wheel vessels. Dravo Corporation announced recently that construction had started at its Neville Island shipyard on the five towboats which are designed for use in the coal trade on the Monongahela and Ohio Rivers. Two of the five vessels are for Jones & Laughlin Steel Corporation, two for Pittsburgh Consolidation Coal Company, and one for Crucible Steel Company. All five boats will be duplicates and will be built on a sectional prefabrication assembly-line basis, the same production technique employed by the company to construct naval vessels during the war. All will be completed by the spring of 1951. Although only about two-thirds as long as the sternwheeler steamboats familiar in Pittsburgh river operations, the five new vessels will have about 25 per cent more performance ability, Dravo naval architects said.

Each boat will be equipped with two diesel engines manufactured by Superior Engine Division of The National Supply Company. Each engine is rated at 533 horsepower or a total of 1,066 horsepower. The towboats will be equipped with Kort Nozzles that encircle each of the twin propellers and increase the "push" and maneuverability of the vessel. It was estimated they can handle six loaded 900-ton coal barges at six miles an hour. Their operating efficiency is further aided by the use of reversing gears which enable the engines to remain running in one direction while the boat is backing. On older boats, it is necessary to stop the engines and reverse their direction. In addition, all main engine controls will be at the pilot's fingertips through Westinghouse Air Brake pilot house remote control systems on each vessel.

Besides the smokeless feature, the new boats will be safer to operate due to their maneuverability

characteristics. Their freeboard, the space between the deck and waterline, will be considerably greater than that of the old sternwheelers. This feature gives the modern boats increased stability. Quarters for the crew consist of seven modern, insulated cabins. Two shower and bath rooms are provided on the main deck and additional facilities for officers are on the upper deck. The galley is modern in every respect. All water used for cooking and drinking on the boats will be brought from shore and stored in 1,500-gallon capacity, plastic lined tanks. All five vessels will have radar systems for operation through fog. This wartime development has found wide use as a navigational aid on the western rivers and has reduced tie-up time considerably. Screw-propelled towboats have gradually been replacing sternwheelers throughout the entire inland waterways system, Dravo officials said. Better and deeper river channels, established through the work of the U. S. Army, Corps of Engineers, permit the use of propeller-type towboats. The five new boats, for which names have not yet been selected, are somewhat similar to Dravo's *Wm. Pitt*, *Freedom*, and *Victory*, which have been operating in the district's sand, gravel, and coal trade for several years.

### MOLDED DIMENSIONS OF FIVE NEW TOWBOATS TO BE BUILT BY DRAVO CORPORATION

Length	108 feet
Beam	26 feet, 6 inches
Depth	9 feet
Draft	6 feet, 6 inches
Horsepower at 750 rpm	533 each engine



New Contractor's Product



Back rip scarifiers, mounted on the back-side of bulldozer moldboards, which rip the ground when the tractor backs up and float on top of the ground when moving forward, are being introduced by Preco Incorporated, Los Angeles, California. This new product is available for all standard straight blade bulldozers. The teeth rip and loosen packed soil, black top and hard ground. They take out rocks and roots and smooth the ground, making forward blading easier and faster. Dead head time is fully utilized. The equipment does not interfere at any time with blading operations. A set of back rip scarifiers consists of four curved shanks clamped lock-on replaceable teeth, each mounted in a separate housing which is welded to the back of the bulldozer moldboard. The teeth are made from the finest steel alloys to insure long life under the most rugged conditions. They can be raised and pinned out of the way when not in use. Contractors who have used this equipment over the past two and a half years verify that back rip scarifiers aid bulldozers in moving more dirt per hour.

September Fifth

That is the day the first copies of the DIESEL ENGINE CATALOG, VOLUME FIFTEEN, will go into the mails. Completely revised from volume fourteen. A big book in every way, 385 pages, 10½ inches by 13½ inches. Every diesel engine, every dual-fuel engine, every natural gas engine actively manufactured and marketed in these United States is technically and completely described and illustrated in this new edition—ready to mail September 5th. Price \$10.00—send order to DIESEL PROGRESS, P. O. Box 8458, Cole Station, Los Angeles 46, California.

New Bulletin Offer

The Catawissa Valve and Fitting Company has just released its new bulletin that illustrates its complete line of hot forged steel unions and valves and includes complete data, specifications, as well as prices. This new catalog is the first general literature release picturing both standard and double extra heavy hot forged steel unions, as well as Catawissa orifice, male and female, lug nut, and full stainless steel and full alloy steel unions. In addition to illustrating single union swing check and spring controlled check valves, the new catalog incorporates complete information on the new double union full opening swing check valve. For further information, write DIESEL PROGRESS, File 37, P. O. Box 8458, Los Angeles 46, Calif.

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TITUSVILLE FORGE DIVISION  
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In many of the new diesel installations where electricity is undesirable, air-starting has solved the problem. Here, once again, Bendix® Starter Drives get the call. For the air-cranking motors on these big, rugged diesels naturally use the finest, most reliable starter drives available, and the Bendix Drive has proven these qualities on over 80,000,000 installations. Its powerful, compact design is easily adapted to meet a wide variety of starter requirements. You'll find it's well worth your while to investigate Bendix Starter Drives—whatever your starting problems may be! Our engineers are always ready to work with you.

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## New York Opens Drive for Diesel Tax Compliance

The New York State Department of Taxation and Finance has initiated a new drive for full compliance with the state's motor fuel tax law and regulations by both sellers of diesel fuel and diesel truck operators—including out-of-state truckers who operate in New York. Through the Department's Miscellaneous Tax Bureau, which administers New York's motor fuel tax law, the state has served notice that tax examiners are checking on diesel fuel sales and use throughout the state. These are the requirements affecting users of diesel fuel on highways in New York State:

1. If you own one or more diesel-powered trucks which operate within New York State, you are considered a distributor under the law and are required by law to register each diesel truck with the State Miscellaneous Tax Bureau. There is a registration fee of 25 cents. This must be done regardless of whether you reside in New York or another state.

2. You are required to report each month your diesel fuel purchases of the previous month, at the same time paying the state tax of 4 cents a gallon on the gallonage reported.

Persons who sell diesel fuel, fuel oil or kerosene

for use in the operation of diesel motor powered vehicles are also subject to the law. They are required to report monthly to the New York Miscellaneous Tax Bureau all sales of such diesel fuel, listing the license number of the diesel truck, the name and address of the owner, the quantity of fuel sold and the date of sale.

Diesel truck owners who fail to file returns or pay the tax on diesel fuel in compliance with the New York law are subject to a penalty of 5 per cent of the tax plus 1 per cent for each month of delinquency. Filing a "wilfully false" return is a felony. Other violations of the law or regulations are misdemeanors, punishable, upon conviction, by a fine up to \$5,000, imprisonment for up to one year, or both. In addition, violations may result in the suspension or revocation of diesel registrations and retail filling station licenses. To apply for registration of diesel trucks, to obtain report forms and for further information as to requirements, owners of diesel trucks which operate in New York and retail sellers of diesel fuel in New York should write to: Miscellaneous Tax Bureau, New York State Department of Taxation and Finance, Albany 1, New York.

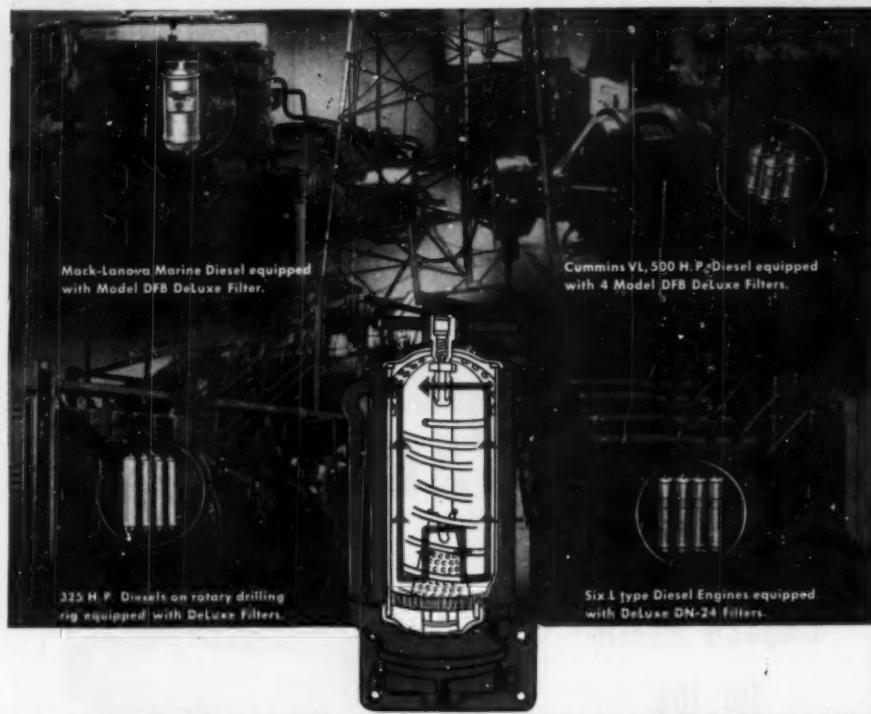
## New Regional Office



The National Supply Company, Superior Engine division, has announced the opening of a new regional office at Kansas City, Missouri, and the appointment of R. C. Straube as regional manager to head that office, according to Mr. Robert M. Pearson, manager of

R. C. Straube

sales for the division. Mr. Straube, a veteran of 25 years experience in the diesel engine field, has been associated with The National Supply Company's Superior Engine Division since 1935. In October, 1946, he was made assistant to the manager of sales at Springfield, Ohio, the position he leaves to assume his new duties. The Kansas City office will serve as headquarters for a territory which covers western Missouri, Kansas, Oklahoma, Colorado, and the Texas Panhandle.



## Get LONGER Diesel Engine LIFE and LOWER MAINTENANCE COSTS with DELUXE FULL-DEPTH Filtration!

### Longer Oil Travel is the Secret of DeLuxe's Thorough Oil Cleansing Principle!

Operators of mobile and stationary diesel engines have enjoyed the benefits of DeLuxe's Full-Depth Filtration Action for over 15 years. The Full-Depth Principle is so basically sound, so simple, that once pointed out it is easy to appreciate the reasons for DeLuxe's outstanding performance.

LONG OIL TRAVEL from bottom to top—the entire length of the filter, instead of the conventional center to side SHORT OIL TRAVEL is essential to thorough oil cleansing. With every DeLuxe Filter you get FULL-DEPTH FILTRATION plus these 3 exclusive DeLuxe Advantages:

1. A patented Spring built into the cartridge that assures uniform density—prevents cartridge collapse under engine pressures.

2. The exclusive metal Cone that insures correct, uniform rate of oil flow—drops heavy particles into the sump.

3. The new, removable Sedisump that collects dirt, water and sludge—makes sump cleaning quick, easy and clean. Proof that the DeLuxe Principle of Full-Depth Filtration actually does the job right is the fact that year after year, 75% to 90% of the Winners of Bus Transportation Maintenance Awards go to DeLuxe users. Last year 15 out of 18 Award Winners were DeLuxe Equipped.

For valuable information on the care and maintenance of all filter-equipped engines, write for your free copy of the "Key to Clean Lubrication".

DELUXE PRODUCTS CORP. 1416 Lake Street, LaPorte, Indiana

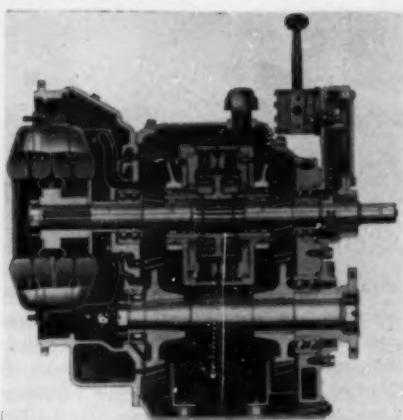


## Appointment at International Harvester

Mr. L. J. Lange, International Harvester Company, has been appointed industrial power product specialist of that company, as was announced by Mr. A. J. Peterson, manager, general sales department, in a recent letter. His duties will be concerned with the design and sale of industrial wheel and crawler tractors, and power units. Mr. Lange succeeds Mr. S. L. Siegfried in this capacity.

Mr. Lange joined the company in 1936 with the gas engineering department on field testing and tractor development. In 1946, he was made service engineer in the territory for industrial power products from January, 1947, until November, 1949. Mr. Lange served as service supervisor. In November, 1949, he was promoted to assistant product specialist.

## New Marine Gear



The old problem of fouled-up engines and rundown batteries from constant operation at trolling speeds may be eliminated with a marine gear which has just been announced by the Twin Disc Clutch Company, Racine, Wisconsin. The completely new reverse and reduction gear includes among its exclusive features a hydraulic coupling trolling drive that permits an over-all reduction ratio 2.5 times the normal fixed reduction ratio. In one of the new units equipped with 3:1 gears, for example, the operator can secure an over-all reduction ratio of 7.5:1 by setting a control valve. This feature is made possible by a variable-fill hydraulic coupling incorporated between the engine flywheel and the reduction gears.

At complete fill, the hydraulic coupling offers all the advantages of fluid power, and the engine can be operated at all speeds. In addition, however, when trolling speeds are required, fluid can be partially emptied from the hydraulic coupling to permit as much as 60 per cent "slip" at reduced engine speeds. This slip permits an additional reduction in propeller shaft speeds up to 2.5 times normal. That is, an engine operating at 900 rpm. through 3:1 reduction gears would turn the propeller at approximately 300 rpm. for normal operation. But, the same engine running at 900 rpm. operating through the trolling drive, would turn the propeller shaft at approximately 120 rpm. First in what will be a complete line of marine gears, the new Twin Disc MGH-220 is designed for engines ranging from 135 hp. to 230 hp. in the 1,400 to 2,100 rpm. class. Complete details may be obtained from DIESEL PROGRESS, File 34, P. O. Box 8458, Los Angeles 46, Calif.

## Coventry Displayed at Trade Fair

Hitherto the small quick-running diesels made by Coventry Diesel Engines Ltd., and known collectively as the Godiva type, have been built only in multi-cylinder forms, up to a maximum of 47 bhp. at 2,500 rpm. Now the range has been extended at the lower end of the power scale by the development of a single-cylinder model with a 12-hr. rating of 5½ bhp. at 1,500 rpm., and a balanced twin diesel rated at 15 hp.

Coventry diesel engines exhibited at the Toronto Fair include a C.D.B. 30-bhp., 4-cylinder marine propulsion engine with reverse and reduction

gear and full electrical equipment; a C.D.4 15/30-hp. stationary power unit complete with clutch, radiator and fuel tank, and two C.D.I. 3/5½-hp. stationary engines, one being complete with radiator, fuel tank and pulley. All the engines have identical cylinder bore and stroke and have interchangeable, easily fitted, dry cylinder liners.

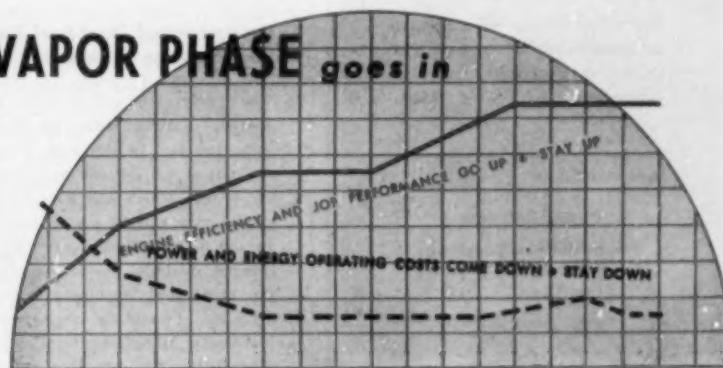
## Roller Bearings Soon Available

Bower roller bearings soon will be available to service outlets through the nation-wide branch facilities of Federal-Mogul Service, division of Federal-Mogul Corporation, according to S. A. Strickland, president of the Bower Roller Bearing

Company, and Guy S. Peppiatt, president of Federal-Mogul Corporation, both of Detroit.

"Federal-Mogul's 59 strategically located branches covering the entire United States will provide broad availability for Bower bearings through an old-established and thoroughly experienced organization," said Strickland. Federal-Mogul Service branches will carry stocks of the very complete Bower line of tapered roller bearings, as well as Bower straight roller bearings, which provide replacement coverage of popular sizes in the automotive trade. Arrangements are now being completed to provide full stocks in all Federal-Mogul Service branches as rapidly as possible.

## When VAPOR PHASE goes in



## Serves Many Varied Needs

Regardless of engine size, nature of business or requirements, Vapor Phase converts old or new engines into long life, super-efficient power units, without increasing the fuel bill. Most users report reduced fuel and maintenance costs.

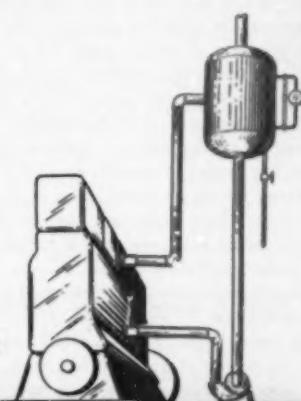
Vapor Phase equipped engines also serve the multi-purpose job of generating steam, heating water, fluids, space or other process, including cooling or heating through air conditioning systems—each as required or all at the same time, for the cost of engine operation only. Permits incredible savings!



Record Engine Performance, Low Cost and even Profit from this VAPOR PHASE installation

Freeport, N. Y., Municipal Power Plant Engine No. 8, a 3,000 HP. 2-cycle Busch Sulzer Diesel with Vapor Phase unit which has been in constant service since early January, 1948.

A second unit, 7,000 HP. capacity, was installed in 1949 to serve another 3,000 HP. 2-cycle Busch Sulzer and a new 3,850 HP. 2-cycle Hardberg Diesel.



VAPOR PHASE pays off in Savings alone, the first year. The unit costs nothing to operate and is good for life.

## VAPOR PHASE Makes Quite a Difference

Freeport knows, since they Vapor Phase equipped 12-year-old Engine No. 8. Immediately this engine started breaking plant records for efficiency and low upkeep. Formerly overloaded at 1,500 kw. load, it now operates at 2,000 kw. load easily and, in emergencies, up to 2,500 kw. load. Fuel consumption now about 10 percent less—lube oil consumption now 1 gallon per 5,000 HP./hrs. against former 3,500 HP./hrs. Ring wear negligible. The Vapor Phase unit also heats the entire plant free, saving \$600-a-month cold-weather fuel bills.

That's why the second Vapor Phase unit went in—to serve Engines 9 & 10 and also furnish steam heat for several buildings in Freeport at a nice profit!

Write or Wire for Information Applying to Your Specific Needs

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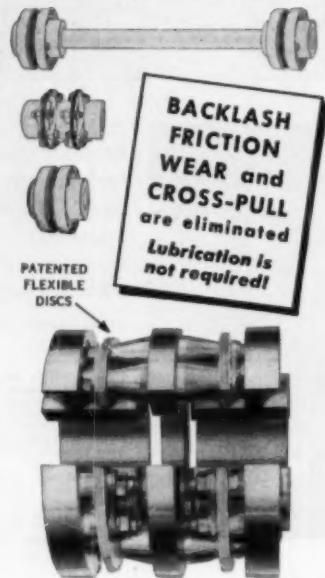
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## Catalog—Volume Fifteen

On September 5th the first copies of the new volume fifteen of the DIESEL ENGINE CATALOG will go into the mails. A complete revision of volume fourteen, with many new engines, many new models, many old models re-rated. In this volume fifteen you will find every diesel engine, every dual-fuel engine and every natural gas engine actively manufactured and sold in these United States, technically and completely described and illustrated. Plus a large and very important accessory equipment section. Truly described as the Bible of the Industry, this volume fifteen of the DIESEL ENGINE CATALOG can be obtained by mailing \$10.00 to DIESEL PROGRESS, P. O. Box 8458, Cole Station, Los Angeles 46, California.

## Supercharged Dual-Fuel Engines to Burn Sewage Sludge Gas in East

The first supercharged, dual-fuel engines that will operate on sewage sludge gas in the east are now being installed in Bay Park, Long Island. They are part of a \$7,500,000 new Nassau County sewage system, which will serve 53 per cent of the county area and 83 per cent of the population. In the main building there will be five supercharged, dual-fuel engines supplied by Worthington Pump and Machinery Corporation, totaling 2,925 hp. Two of the engines will drive Electric Machinery Manufacturing Company a-c generators which will supply electric energy for the main sewage-treatment-plant power requirements. Two other engines will drive Roots-Connersville rotary positive displacement type blowers which will supply the necessary air for distribution in the aeration tanks. They will each have a rated capacity of 8,500 cfm. of free air at 8 psi.

The fifth and largest unit is a combination drive to both a 500 kw. generator and 16,000 cfm. blower. Space is reserved for another combined unit of this type for future installation. In these combination units the engine is directly connected to the generator and the blower is connected by means of a special disconnecting type coupling, thus permitting the blower to be disconnected when the unit is used for power generation. In full operation, the plant will produce daily about 170,000 cubic feet of sewage sludge gas having a heating value from 550 to 600 Btu. per cubic foot, which will be available for use as a fuel to operate the engines. Development of the dual-fuel diesel was pioneered by Worthington engineers in 1939 with the first American installation in the Tallman's Island sewage treatment plant of the City of New York. Upon completion, the new Nassau County treatment plant will include the most advanced power generating and air blowing equipment. It will incorporate two of the most successful improvements in engine and plant design made in recent years. First, dual-fuel operation will permit the use of gas or oil fuel at any ratio on the high compression diesel cycle with its inherently high thermal efficiency. Second, engine supercharging will allow maximum power for a given space allotment. The plant, which is expected to be placed in operation at the end of this year, will treat 27,000,000 gallons of sewage per day when in full operation.

## New Branch for Cummins



Expanded facilities for serving trucking, mining, petroleum, and industrial needs in Central Illinois and part of Iowa are being made available by Cummins Diesel Sales Corporation of Illinois at a new branch location in Peoria, Illinois. The branch serves an area extending from west of Des Moines, Iowa, to the Illinois-Indiana line, although Chicago operations are covered by Chicago headquarters to 1700 South Indiana Avenue. The new building, with its 10,000 square feet of area, houses seven truck bays with complete overhead monorail and hoisting installations for the speedy servicing of trucks. Complete tools and equipment are available for the cleaning section, inspection department, rebuild section, and testing department for engines and assemblies. A full line of factory-warranted parts will be stocked along with exchange assemblies. The branch will be managed by Edward Sandtner. Marshall Shaw is the sales engineer, and Harry Krusinger is parts manager. All are of Peoria. A crew of five factory-trained mechanics complete the staff.

## New Korfund Bulletin

Characteristics of the various types of vibration isolation media—springs, rubber, and cork materials—are given in a new bulletin, G-102, released by The Korfund Company, Inc., 48-20-B 32nd Place, Long Island City 1, New York. Fifty typical machine and equipment applications are tabulated with recommendations for proper types of vibro-isolators for highest efficiency and with alternates for satisfactory operating efficiency for less exacting requirements. Various types of standard mountings are described with data or loading ranges which run from 10 lbs. for small isolators to 50,000 lbs. per isolator for a heavy duty spring type. Specific purpose isolators for business machines, fan and motor units and other applications are also described. Typical specification clauses for installation contracts are also given.

## Murphy Diesel Awarded Contract

The first June diesel contract listed by the Department of the Army was let out by the Chicago Procurement Office, Corps of Engineers, Chicago, Illinois. Murphy Diesel Co., of Milwaukee, Wisconsin, was the successful bidder. Quantity was one lot valued at \$139,358.



DIESEL PROGRESS

### New Time and Labor Saving Solvent

The Marine Service Division of the Magnus Chemical Company announces an improved solvent remover for carbonized oil and grease deposits, which is particularly valuable in marine and power plant operations. Magnus Carbon Solvent is an outcome of war time work with the U. S. Army Air Service Command, during which a new type of solvent was developed which made it possible to clean heavily encrusted airplane engine parts with minimum hand work and in greatly reduced time. Greatly improved in effectiveness, the new Magnus Carbon Solvent contains chemical ingredients which rapidly penetrate carbonized oil deposits down to base metal, loosening them so that they can be easily flushed off. There is no danger of harmful action of any kind on any metal, including copper, brass, aluminum, silver, zinc, diecast metals and even highly polished steel.

An outstanding feature of the new solvent is its exceptionally long service life. The solution can be used over and over again for much longer periods than any other carbon removing compound now available. A short soak in Magnus Carbon Solvent is sufficient to remove carbonized deposits from oil burners and from oil valves and hot oil lines. On fuel oil heaters, the solution is circulated for a period of an hour or less, depending on the degree of encrustation. On diesel and gas engine parts, Magnus Carbon Solvent will remove carbonized oil deposits following a soak period and final water rinse in much shorter time than with other carbon removers. The cleaning time can be cut to minutes, however, and the hand brushing eliminated, by using this solvent in a Magnus Aja-Dip Cleaning Machine. This improved solvent remover for carbonized oil and grease is not only applicable to ship and shore power plant operations, but to ship repair yards where engine overhaul is carried on.

### New 152 Horsepower Truck Diesel

The Buda Company, Harvey, Illinois, announces the development of a new heavy-duty truck diesel suitable for operation in all kinds of trucks, buses, and tractors, carrying gross loads up to 52,000 lbs. Model 6-DTS-468 is a supercharged diesel engine developing 152 horsepower and a maximum torque of 370 lbs.-ft. at 1,600 rpm. The engine has a bore of 4 1/4 inches, a stroke of 5 1/2 inches, and a piston displacement of 468.3 cu. in. It is a 6-cylinder model, full diesel, solid injection type. The features of this new Buda truck diesel are greater torque and horsepower packed into a compact, comparatively lightweight power plant. The overall length of the unit from the flywheel housing to the front of the fan is 47 9/16 inches; the width at the widest point is 29 1/2 inches. The unit weighs without electrical equipment and air compressor only 1,418 lbs.

The crankshaft is completely counterbalanced with 12 counterweights and a torsional vibration damper on the front end to insure quiet, smooth, vibrationless operation. A large number of the engine parts, such as the manifold, the valve covers, brackets and connections are made of aluminum alloy to provide extra strength and

keep the weight down. The supercharger is belt-driven with step-up gears built into the supercharger for low drive belt speeds. The supercharger is positive displacement type with helical cut gears to obtain quietness. It needs no attention except for periodic lubrication. Low fuel consumption is assured because of Buda's controlled turbulence, slow pressure combustion system. There are more uniform pressures on the piston and moving parts, and this combustion system results in more thorough utilization of fuel so that there is no wasted fuel in the form of heavy black smoke.

### F-M Enter Canadian Locomotive Field

Fairbanks, Morse & Co., Chicago manufacturers, and The Canadian Fairbanks-Morse Company Limited of Montreal have recently entered the Canadian railroad diesel locomotive field through the purchase of a substantial stock interest in the Canadian Locomotive Company of Kingston, Ontario—the oldest firm of its kind in Canada, which has a capacity of fifteen steam type locomotives per month. The directors and stockholders of the Canadian Locomotive Company, at a meeting held June 5th, approved the stock purchase plan which places the control of the future operations of the company with Fairbanks, Morse & Co. of Chicago and The Canadian Fairbanks-Morse Company Limited of Montreal.

Immediately following the stockholders meeting, the directors elected Robert H. Morse, Jr., president and chief executive of the Canadian Locomotive Company. Mr. Morse is president of Fairbanks, Morse & Co. of Chicago and chairman of the executive committee of The Canadian Fairbanks-Morse Company Limited of Montreal. Mr. Morse announced that Fairbanks-Morse officials and engineers will immediately lend all assistance possible to tool up and start making all types of diesel locomotives in the Canadian plant so that delivery can start at an early date. The Canadian Locomotive Company, which was founded one hundred years ago, will retain its corporate identity and will be operated as a separate concern. Its products will continue under the same name. The diesel locomotives, as manufactured in the Canadian plant, will use as their source of power the well known opposed piston type of diesel originally designed by and perfected in the Fairbanks-Morse plant at Beloit, Wisconsin. Several million horsepower of this type of engine are now in use. According to Mr. Morse, the new diesel locomotive activities will greatly augment the production of Fairbanks, Morse & Co. and is another forward step in their program to expand rapidly this phase of the company's business.

### Small-Size Socket Screw Bulletin

The Bristol Company, Mill Supply Division, has just published a bulletin on the recently announced small wire-size multiple-spline socket cap screws and set screws. Six-page Bulletin 881 is liberally illustrated and gives full information on specifications and prices of socket head cap screws in sizes as small as No. 2 wire size and set screws. Copies are available from The Bristol Company, Waterbury 20, Conn.

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DIESEL  
ENGINE  
CATALOG  
VOLUME FIFTEEN

READY  
SEPT. 5<sup>th</sup>

# DIESEL ENGINE CATALOG

ENTIRELY REVISED AND RE-WRITTEN

Volume Fifteen of the DIESEL ENGINE CATALOG will be ready to mail September Fifth—a complete revision of Volume Fourteen—many new engines, new models, new ratings.

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PER COPY

Entirely revised and re-written, this catalog is a MUST for Design and Operating Engineers. Indispensable to buyers of either engines or accessories. Invaluable to Students and Instructors. Tremendously valuable to all Diesel Salesmen and Accessory Salesmen. In no other book can be found such complete and detailed information on Diesel engines, Dual-fuel engines and Natural Gas engines.

Re-written in its entirety, detailed attention has been given to make this fifteenth edition of the DIESEL ENGINE CATALOG an easy-to-read book. Its comprehensive classification and indexing, all contribute to making it easy for YOU to find what you want in this book. Five books in one with five integral sections, this catalog is indispensable whether for technical reference or selective buying.

The five separate sections break down as follows: (1) An engine section fully illustrated with complete technical descriptions and specifications. (2) An accessory section describing engine and plant accessories. (3) A transmission section describing torque converters, etc. (4) A classified buyers' guide giving you valuable information as to the source of many things you buy in this industry. (5) Advertising section.

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DIESEL ENGINE CATALOG

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Enter my order today for a copy of the 1950 Diesel Engine Catalog, Volume Fifteen, Edited by Rex W. Wadman, for which I enclose \$10.00, also payable at £4. 8s. Od. to E. H. Doddrell, 342 St. Paul's Corner, Ludgate Hill, London E.C.4.

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Worthington Names Central Manager and Buffalo District Manager



J. W. Stovall



W. A. Meiter

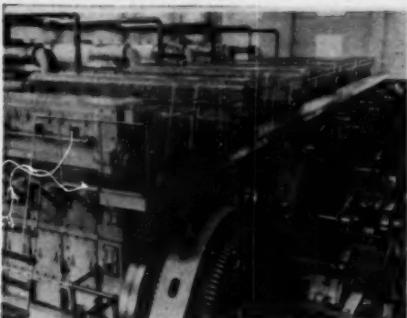
A newly-created position of central sales manager, directing the sales of Buffalo, Detroit, Cleveland, Cincinnati and Pittsburgh offices, has been filled by William A. Meiter, according to an announcement by T. J. Kehane, general sales manager of Worthington Pump and Machinery Corporation. John W. Stovall has been appointed manager of the Buffalo district sales office, succeeding Mr. Meiter. Mr. Meiter graduated from Ohio State University with a mechanical engineering degree in 1927 to become a member of the Worthington Training Class of that year. He then became a sales engineer in the Cleveland district sales office, where he remained until he was named manager of the Buffalo office in 1938. A member of the Erie Chapter of the New York State Society of Professional Engineers and president of the National Sales Executives of Buffalo, Meiter also is vice president and director of the Chamber of Commerce, Rotary Club and Athletic Club, all of Buffalo. He is a member of Theta Tau fraternity. Snyder, New York, has been his home until this move, which will take him to Detroit, where he will make his headquarters.

Mr. Stovall, appointed Buffalo district sales office manager effective July 1st, has been with the company 21 years. He attended Carnegie Institute of Technology and then joined the Worthington organization as an estimator in the Pittsburgh district sales office. He became a sales engineer there in 1932. Ten years later he was transferred to the Rochester branch office, where he has served as a sales engineer until he was transferred to the Buffalo district sales office in June. A member of the Engineering Society of Buffalo and the Rochester Engineering Society, Mr. Stovall also is a member of the Buffalo Athletic Club, University Club of Rochester, Central Railway Club of Buffalo, and Sigma Nu. He is president of the Board of Education of Water Valley, New York, and a member of the official board of the Hamburg Methodist Church, Hamburg, New York, where he makes his home.

New Order for Baldwin

The Baldwin Locomotive Works has announced the receipt of orders aggregating 92 diesel-electric switching, road switching, and road locomotive units, including: fourteen 1,200-hp. diesel-electric switching locomotives for the Lehigh Valley Railroad; eighteen 1,600-hp. diesel-electric road switching locomotives for the Chesapeake & Ohio Railway; and eight 1,600-hp. diesel-electric road switching locomotives for the Missouri-Kansas-Texas Railroad.

## Increasing Plant Output



The city of New Bern, North Carolina, has added a sixth National Supply Company Superior diesel engine to their municipally owned diesel electric power plant. The plant, completed in 1948 at a cost of \$600,000, was originally built with five Superior engines installed. Prior to 1948, the city had used steam turbine-driven generators. In 1947, although operating all available equipment, part of the city's electrical needs had to be purchased. It was this situation which led to the building of the new plant. Before deciding on diesels, city officials considered three other methods of supplying necessary power: (1) purchasing the amount of power needed; (2) building a new steam plant and moving to the new location the steam equipment owned at that time; (3) building a diesel plant. Comprehensive economic studies were made to determine the relative merits and costs of each of these plans. Results showed conclusively that a diesel electric plant would more nearly solve the city's power problems. A contract was let for five Superior supercharged diesels which would develop 1,000 kw. each. The sixth engine is a duplicate of the five originally installed and is a supercharged unit producing 1,440 hp. at 360 rpm. It has eight cylinders of 14½-inch bore and 20-inch stroke and is equipped with oil cooled pistons, Woodward hydraulic governor, duplex fuel oil filter, automatic alarm and emergency shut-down systems, and many other modern features.

## Baldwin Raises Horsepower on Diesel-Electric Locomotives

As part of an established program of engineering research having as its objective the provision of maximum hauling capacity and flexibility in its standard types of diesel-electric locomotives, Baldwin has announced increased horsepower ratings and also increased tractive effort ratings or continuous rating speeds on the complete Baldwin-Westinghouse line. This constitutes the first major revision on all models since the war. All units are affected and the complete line now includes: 800-hp. and 1,200-hp. switches; 1,600-hp. all-service locomotives with either 4- or 6-wheel trucks and with either 4 or 6 traction motors; a 2,400-hp. road transfer locomotive; and 1,600-hp. road units which can be operated in multiple to form 3,200-hp., 4,800-hp., or 6,400-hp. locomotives. All ratings represent horsepower available for traction. Optional gear ratios are offered in the 1,600-hp. all-service locomotives, in the 2,400-hp. road transfer locomotive, and in the 1,600-hp. road locomotive units, permitting a wider latitude in the selection of speed and power capacities to suit a particular

service. Of paramount importance from a maintenance standpoint is the fact that these changes have been made without seriously affecting the interchangeability of parts between older Baldwin locomotives and the new units.

## De Laval Offers New Bulletin

The De Laval Steam Turbine Company has available a new bulletin describing the De Laval A315A IMO rotary pump. The new pump is a general service screw-type rotary pump designed for pumping petroleum products, and other light viscous fluids, as required for rotary and steam

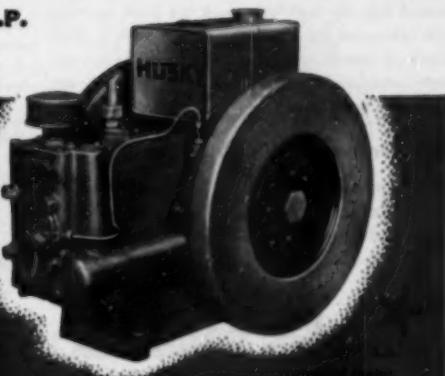
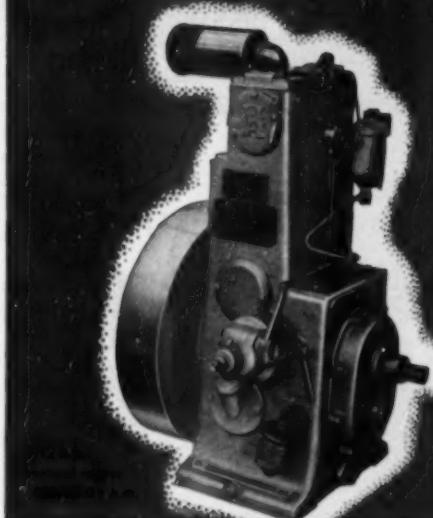
atomizing oil burners, oil transfer, lubrication, hydraulic systems and similar services. Capacities to 85 gpm.—pressures to 150 psi. The bulletin contains a cross-section drawing, description of the IMO pumping principle, viscosity tables, dimension drawings and table of standard NEMA motor frame sizes. Main features of the pump are: pulsation free flow; pump can be mounted in any position and driven by direct connected shaft, V-belt or chain; mechanical shaft seals; pre-lubricated bearings; optional types of mountings. For further information write DIESEL PROGRESS, File 38, P. O. Box 8458, Los Angeles 46, California.



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at 1200 r.p.m.  
3 models 2-4 cylinders, 27/52 h.p.  
at 1500 r.p.m. (B.E.S.A. ratings)

### MARINE AUXILIARY

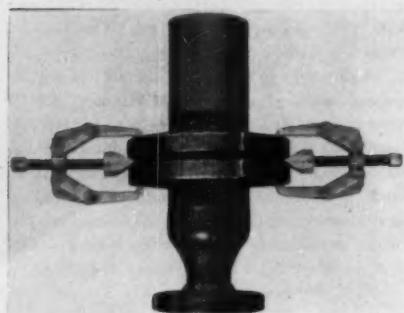
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MEXICO—MAQUINARIA E INGENIERIA S.A., MEXICO CITY  
COLOMBIA—IGNACIO GOMEZ Y CIA., BOGOTA

### New Pipe Flange Spreader



A pipe flange spreader to remove an old gasket when necessary to install a new one has been announced by the Owatonna Tool Company. Two OTC Grip-o-matic Pullers combine to accomplish a difficult job with two removable wedges on the forcing screws to spread the pipe flanges. An especially useful tool in utility plants, refineries, mills and industrial plants of all kinds. The jaws are hooked into the bolt holes with the tools opposite each other and the forcing screws are turned alternately to spread the flange uniformly. For complete information write DIESSEL PROGRESS, File 40, P. O. Box 8458, Los Angeles 46, California.

### New Orders for Lima-Hamilton

Lima-Hamilton Corporation has announced receipt of orders for two large Hamilton diesel engines, both two-cycle units with 2½-inch bore

and 27½-inch stroke with rotary valves. One is an 8-cylinder marine diesel for Pittsburgh Steamship Company for installation in the ship, *Eugene W. Parney*, with a rating of 3,570 brake horsepower, 252 revolutions per minute, geared down to 110. This unit, Lima-Hamilton said, will set the pace for Great Lakes shipping, and delivery will be made in time for installation when the ship is laid up for the winter.

The second Hamilton diesel is a 6-cylinder engine to drive a 2,000-kilowatt direct-current generator for use in the electrolytic refining of copper. This order is for the Perth Amboy, N. J., plant of the Raritan Copper Works of International Smelting and Refining Company, a subsidiary of Anaconda Copper Mining Company. Operated at 250 revolutions per minute, direct connected to generator, the diesel is designed so it can be converted to dual fuel operation by the addition of gas injector equipment. This unit is engineered for 24-hour day operation, 365 days a year.

### New 1950 Equipment Folder

In order to provide up-to-date operating data on Eutectic's new 1950 line of welding equipment, the company has published a handy, pocket-size "equipment folder," available to shop owners, foremen, and welding superintendents upon request. Full design specifications are given for both EutecTorch No. 1, used for light and general work, and for EutecTorch No. 2, for heavier work. Distinctive features of these torches are listed and

the uses to which they may be put—both torches are available with cutting attachment—are indicated.

EutecArc, the efficient "double-duty" AC arc welding machine, which is capable of handling both extra-light and extra-heavy work, is also covered in this folder. Many of the advantages of this arc welder are fully described, and all necessary operating information is shown. Part of the folder is devoted to a complete listing of additional accessories for gas and arc welding offered by Eutectic Welding Alloys Corporation. And in addition, the folder contains a useful coupon, which entitles the recipient to a free demonstration right in his own shop, without cost or obligation of any sort.

### Catalog—Volume Fifteen

On September 5th the first copies of the new volume fifteen of the DIESEL ENGINE CATALOG will go into the mails. A complete revision of volume fourteen, with many new engines, many new models, many old models re-rated. In this volume fifteen you will find every diesel engine, every dual-fuel engine and every natural gas engine actively manufactured and sold in these United States, technically and completely described and illustrated. Plus a large and very important accessory equipment section. Truly described as the Bible of the Industry, this volume fifteen of the DIESEL ENGINE CATALOG can be obtained by mailing \$10.00 to DIESEL PROGRESS, P. O. Box 8458, Cole Station, Los Angeles 46, California.



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All of the smart diesel engine salesmen carry this book around in their car. When they run into some new competition with which they are not too familiar—the Diesel Engine Catalog gives them full, detailed information when they need it most and need the data to be accurate.

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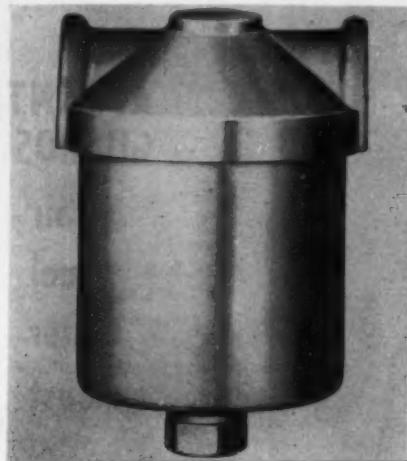
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### New All Metal Gasoline and Diesel Fuel Filter



A new and unusual gasoline line filter for automobile, truck, tractor and other gasoline engines and medium size diesel engines has recently been introduced by the Sparkler Manufacturing Co. The filter provides a positive seal against leaks by utilizing a series of V-shaped filter discs so arranged within the high-pressure cast aluminum housing that they can be bolted directly into the housing cover. This method assures a tight seal without the use of springs or other resilient materials. The V-shaped discs are covered with a filter media of non-woven rayon cloth that separates water from gasoline in addition to micronic dirt and sediment particles. The cloth is easily cleaned by washing the discs in gasoline.

Due to the unique method of arranging the V-shaped discs, the filter provides an extremely large effective filtering surface within a very small space. The resulting large capacity makes the filter adaptable to almost all types of gasoline engines, and medium size diesel engines. All parts are rust-proof, and the unit is easily dismantled for replacing or cleaning the discs. It is made in a full line of sizes and has been engineered for mass production so that it can be marketed at an exceptionally low price. For further information write DIESEL PROGRESS, File 42, P. O. Box 8458, Los Angeles 46, Calif.

### ABOE Awarded Contract

Confirmation of an order for 110 diesel engines to serve as power units for Minneapolis-Moline tractors purchased by the Greek Ministry of Agriculture with ECA aid in furtherance of that country's agricultural rehabilitation program has been announced by Ronimund Bissing, president of Associated British Oil Engines, Inc., New York.

The engines are of the Meadows model 4DC-420, a 4-cylinder automotive type with a rating of 60 bhp. at 1,275 rpm's. Value of the order, Mr. Bissing disclosed, is in excess of \$150,000, payable in pounds sterling. Assembly of the tractors from the United States and engines from England will be completed by local Greek mechanics under the supervision of Minneapolis-Moline and Meadows field technicians.

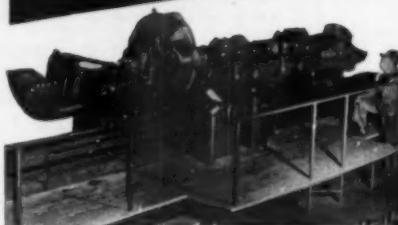


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### Comparator for Corrosion Control of Coolants

A new slide comparator has been developed by W. A. Taylor & Company, Baltimore, Md., for corrosion control in the cooling fluids of air conditioning systems, refrigerating brines, diesel engine cooling systems, condenser cooling water, etc. With a single slide comparator, it is possible to check the pH (active alkalinity) and the chromate content.

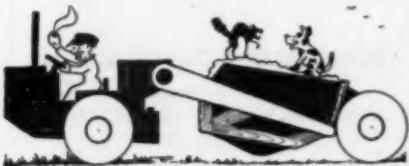
The comparator consists of a base and a slide, both molded from plastic. The base contains two vials of pH indicator solution with 0.5 ml. pipettes and five 5 ml. test tubes. Each color standard slide contains five pH standards (cresol red pH 7.2, 7.6, 8.0, 8.4 and 8.8) and four chromate standards with values suitable for the application. For example, in air conditioning systems the values 300, 400, 500 and 600 parts per million of sodium chromate are usually employed. The value of each standard is engraved on the slide. The complete comparator is 10 inches long, 2½ inches wide, 4 inches high, and weighs only 1½ pounds. For further information write DIESEL PROGRESS, File 33, P. O. Box 8458, Los Angeles 46, Calif.

### Change of Name

Change of name of Associated British Oil Engines, Inc., to ABOE, Inc., as a public relations move to facilitate general operative procedure, has been announced by Ronimund Bissing, company president. No revisions in company plans or policy are involved, he said.

"Ever since our formation here last October as part of the international effort to help make American-British trade more self-sustaining, our friends and customers seem to have preferred use of the abbreviated name 'ABOE,' composed of our initial letters," Mr. Bissing explained. "To please them, and to obviate further incidental confusion on the part of postal, communications and other people, we recently initiated proceedings to legalize that name. It has now been formalized. The name change, of course, involves no revisions in company plans, personnel or policy. It is purely a public relations move."

The group is composed of: Petter, Meadows, Petter-Fielding, McLaren, Mirrlees, and National. All of these companies have long-standing reputations for quality of product. Mirrlees is the world's oldest commercial diesel engine producer. Its first engine appeared on the market in 1897, and continued in service until 1936, when it was sent to the Glasgow Exhibition, then to the Science Museum at South Kensington, where it is now on exhibit. Petter has been in the diesel field since 1898.



AUGUST 1950

93

# DIESEL ENGINE CATALOG

VOLUME FIFTEEN

ENTIRELY REVISED AND RE-WRITTEN

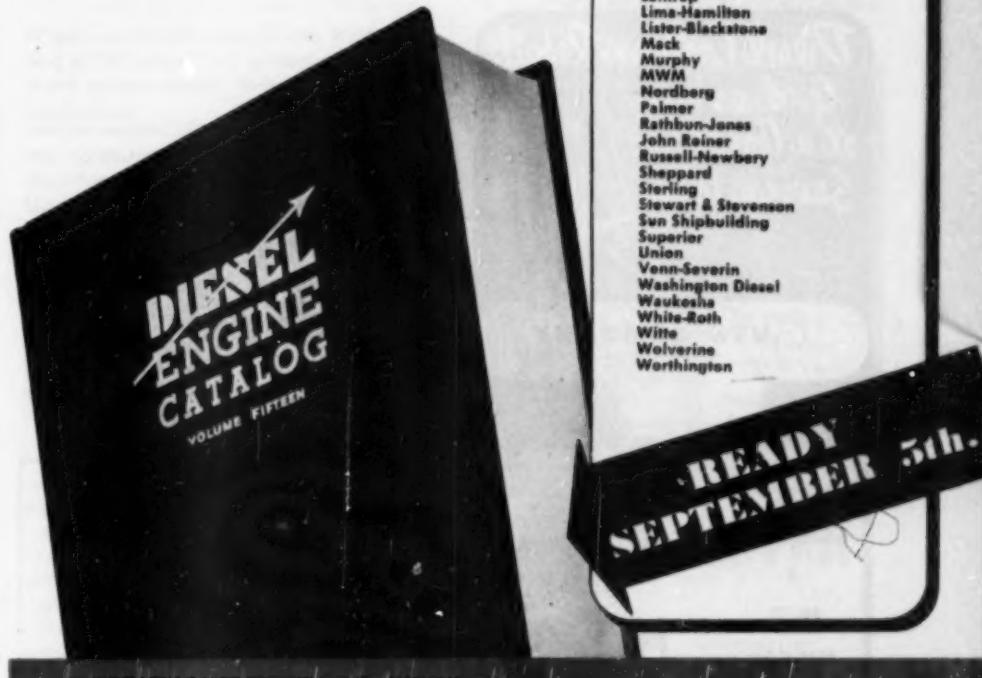
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American Locomotive  
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Baldwin Locomotive Works  
Buda  
Burmeister & Wain  
Caterpillar  
Chicago Pneumatic  
Clark Bros.  
Cleveland Diesel  
Consolidated Diesel Electric  
Continental  
Cooper-Bessemer  
Crofton  
Cummins  
Detroit Diesel  
Electric-Motive  
Enterprise  
Fairbanks-Morse  
Fulton  
Graymarine  
Hallett  
Harnischfeger  
Hercules  
Hill  
Ingersoll Rand  
International Ferment  
International Harvester  
Lathrop  
Lima-Hamilton  
Lister-Blackstone  
Mack  
Murphy  
MWM  
Nordberg  
Palmer  
Rathbun-Jones  
John Reiner  
Russell-Newbery  
Sheppard  
Sterling  
Stewart & Stevenson  
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### DIESEL ENGINE CATALOG

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AC Generators in ratings 1 to 100 KVA can be furnished. Top illustration is a two-bearing self-excited, self-regulated type... lower two-bearing direct connected exciter type.

DC Generators are available in ratings 1 to 100 KW. At the right is a two-bearing self-excited type... also available with direct connected exciter.

AC and DC Generators can also be furnished in single bearing, flange mounted type... sealed, pre-lubricated, ball bearing construction.



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## WEST COAST DIESEL NEWS

By FRED M. BURT

BUILT on Makela Bros. ways, Noyo, Calif., new 45-ft. trailer *Sea Wolf*, for Dick Wirts, Fort Bragg, Calif., is powered with a 165-hp. General Motors, 6-cyl. diesel installed by West Coast Engine & Equipment Company.

POWERED with a "Caterpillar" D13000 marine diesel supplied by NC Marine, Seattle, is Hansen-built seiner, *Janet M.*, owned by Delbert Nix, latest vessel in the Haida fleet that fishes for the Indian community of Hydaburg, Alaska.

TO POWER Emsco drilling rigs, three 400-hp. Superior diesel drilling engines, supplied to Emsco Derrick & Equipment Co., Los Angeles, by National Supply Co. through Lewis Livesley, diesel sales manager, Torrance, Calif.

FIVE new Southern Pacific *Sunset Limited*, stream-lined diesel-driven trains for fast 42-hour schedule in 2,070-mile run on Sunset Route, Los Angeles-New Orleans, total cost of trains \$15,000,000, will go into operation in August. Los Angeles to Del Rio, Tex., powered by 6,000-hp. EMD diesel locomotives; Del Rio to New Orleans by 4,000-hp. American Locomotive diesel units.

*TONY BOY*, yard tug for Martinolich Shipbuilding Corp., San Diego, has been re-powered with a 225-hp. General Motors marine diesel, with 3:1 reduction gear.

TWO NEW tuna clippers under construction by Martinac Shipbuilding Co., Tacoma, will be powered with 8-cyl., 615-hp. Superior marine diesels.

A NEW 15-unit fleet of C.O.E. International tractors powered with 200-hp. Cummins diesels, purchased by Santa Fe Railway, is being used in the new less-than-carload freight truck service for 114 cities, San Francisco, Los Angeles, Long Beach, San Bernardino, San Diego and intermediate points.

THE OLD 125-foot tuna clipper *Northwestern* is being rebuilt in San Pedro for fishing under command of Fred Ostrom. Powered with a 500-hp. Atlas diesel, the restored vessel will be renamed *Big Fisherman*.

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Unit Capacities  
10 to 1875 Kva  
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Write or wire today for bulletin and complete information regarding these fine fully guaranteed, low cost DIESEL ENGINE GENERATING UNITS. Visit our plants at Sausalito (S. F.), California, and Jersey City, N. J., and see units in operation on our test stand.

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**\$24.50**

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Alameda Calif.

## Attention: Established Manufacturers' Agents

SONOFLUX, the new, portable magnetic testing machine, proved in the oil fields, is moving into new markets. Read the complete story on SONOFLUX in the June issue of DIESEL PROGRESS.

Write for further information concerning sales territories, commission arrangements, etc., to see if you can qualify as an agent in your territory.

## SONOFLUX CORPORATION

Mr. W. H. Hopkins  
Commerce Building, Houston, Texas  
Central 7431

TWO P & H 65-hp., 3-cyl. diesels supplied by Engine Sales & Service, Los Angeles, for Robt. Livingston, Bagdad, Calif., will be used in a mining project to power a Burk 40-kw. generator and a 30-inch crusher by direct drive.

SUPPLIED by Shepherd Diesel Marine, San Diego, two 75-hp. "Caterpillar" diesels with 2:1 Twin Disc reduction gears for shrimp trawlers *Conchita* and *21 de Abril*, operated by Congeladoras Marinas en Alta Mar, S.A., Guaymas, Mex.

PURCHASED by Advance Lumber Co., Kernville, Calif., a 165-hp. Murphy diesel to drive saw through V-belt, cutting 25,000 feet of pine daily in their sawmill at 7,000 ft. elevation.

IN ADDITION to Emil Riutta and Don Farmer's Engine Sales & Service as Southern California distributor for the new P & H (Harnischfeger Corp., Port Washington, Wis.) diesels, Bryant's Marina, Seattle, will cover the Pacific Northwest and Alaska, Northern Engine & Equipment Co., in British Columbia (industrial branch in Edmonton, Alberta), Parker Diesel Engineering Co., Oakland, Calif., in Northern California.

PURCHASED by Fruit Growers Supply Co., Westwood, Calif., five Peterbilt logging trucks powered with 275-hp. Cummins diesels, to handle timber used in box making.

THE ALASKA limit purse seiner designed by Jas. Petrich and recently launched by the Western Boat Building Co., Tacoma, is powered with a 120-hp. Enterprise diesel working through a 2½:1 Western gear.

DESIGNED by Wilvers & DeFever, San Pedro, 113-foot tuna clipper *Cape Beverly* on first trip for South Pacific Canning Co., Long Beach, besides 615-hp. Superior diesel propulsion engine, has two 250-hp. GM 100-kw. generator units.

ALASKA-limit seiner *Memories*, recently built by Geo. Peterson, Tacoma, for himself and Capt. Marko Malich, is powered with a 171-hp. Buda diesel driving through an hydraulically-operated 2:1 Western Gear Works reduction gear to turn the wheel at 400 rpm.

THROUGHOUT the summer, Hallet Mfg. Co., Los Angeles, is shipping 200 one-cylinder water and air-cooled diesels to the Grecian government to be distributed to farmers for use in irrigating.

FOR INSTALLATION as standby unit in heating plant at Army Base, Albuquerque, N. M., by E. O. Nay Co., a 12-cyl., 500-hp. "Caterpillar" diesel driving a 300-kw. G.E. generator, supplied by Shepherd Tractor & Equip. Co., Los Angeles.

A TEST installation at Seattle Shipbuilding Co. of a Vapor Phase heat recovery unit (Engineering Controls, Inc., Los Angeles) operating on waste heat from cooling water and exhaust gases on a 100-hp. "Caterpillar" diesel, is operating an absorption refrigerating machine (Latta Bros., Seattle) for fishing vessel hold refrigeration. In the rated 2-ton (per hour) plant, 30 lbs. of steam (at 15 psi.) per hour per ton of refrigeration down to -20°, is resultant.

DESIGNED by Jake Eremenko, Ft. Bragg, Calif., 41ft. combination boat just finished by Joe Perry, Ft. Bragg, on his new marine railway on the Noyo, is powered with a 3-cyl., 82-hp. GM diesel.

*VECINO BUENO*, new 54-ft. steel shrimp trawler from Tacoma Boat Building Co., to work out of San Diego off the west coast of Mexico, is powered with a 90-hp. Washington diesel. The vessel's trawl winch is driven with a Hercules diesel.

### September Fifth

That is the day the first copies of the DIESEL ENGINE CATALOG, VOLUME FIFTEEN, will go into the mails. Completely revised from volume fourteen. A big book in every way, 385 pages, 10½ inches by 13½ inches. Every diesel engine, every dual-fuel engine, every natural gas engine actively manufactured and marketed in these United States is technically and completely described and illustrated in this new edition—ready to mail September 5th. Price \$10.00—send order to DIESEL PROGRESS, P. O. Box 8458, Cole Station, Los Angeles 46, California.

### Lubrication

The July issue of *Lubrication*, a technical publication devoted to the selection and use of lubricants, is particularly interesting to our readers. It is devoted exclusively to the problems confronting users of gas and dual fuel engines. Well illustrated, well written. You can readily obtain a copy, without charge, from Mr. A. R. Dunphy, The Texas Company, 135 East 42nd Street, New York 17, New York.

### Literature by D-A

A circular on the new D-A Diesel Oil now is available and may be obtained from the D-A Lubricant Company, Inc., Indianapolis, Indiana. The folder describes how and why D-A Diesel Oil reduces engine deposits and neutralizes destructive combustion chamber acids. The free circular, for example, discusses the recently identified problems encountered with the appearance of fuels having a high-sulfur content.

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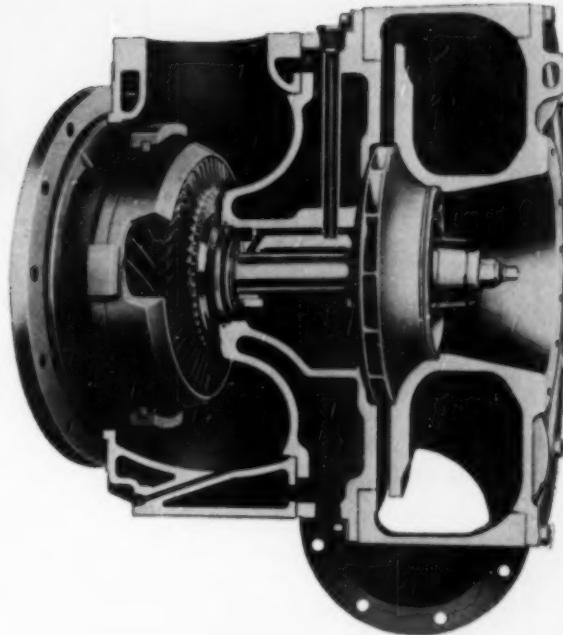
## ADVERTISERS' INDEX

ABOE, Inc. ....	30	Johnson Bronze Co. ....	63
Adeco Products, Inc. ....	95	Koppers Company, Inc. ....	23
Aerofin Corporation ....	94	Kraissl Company, Inc., The. ....	96
Aluminum Company of America. ....	14-15	Kurz & Root Co. ....	94
American Air Filter Co., Inc. ....	7	Learner Company, The. ....	94
Atlantic Metal Hose Co., Inc. ....	91	Lister-Blackstone, Inc. ....	81
Bacharach Industrial Instrument Co. ....	91	Magnus Chemical Co., Inc. ....	90
Brown & Sharpe Mfg. Co. ....	77	Marley Company, Inc., The. ....	3
Burmeister & Wain ....	27	Marquette Metal Products Co. ....	18
Buchi, Dr. Alfred J. ....	74	Maxim Silencer Co., The. ....	76
C. A. V. Ltd. ....	78	National Supply Co., The. ....	9
Cities Service Oil Co. ....	71	National Welding & Grinding Co. ....	92
Cleveland Diesel Engine Div., General Motors Corp. ....	2	Oakite Products, Inc. ....	82
Columbia Electric Mfg. Co. ....	92	Pesco Products Div., Borg-Warner Corp. ....	16
Cooper-Bessemer Corp. ....	Fourth Cover	Petrometer Corp. ....	95
Crofton Diesel Engine Co., Inc. ....	94	Pierce Governor Co., Inc., The. ....	95
DeLaval Separator Co., The. ....	5	Reiner & Co., John. ....	75
Delco-Remy Div., General Motors Corp. ....	11	Rockford Clutch Div., Borg-Warner. ....	72
DeLuxe Products Corp. ....	84	Ross Heater & Mfg. Co., Inc. ....	6
Detroit Diesel Engine Div., General Motors Corp. ....	4	Russell, Newbery & Co., Ltd. ....	89
Diamond Chain Co., Inc. ....	70	Schoonmaker Co., A. G. ....	94
Eclipse Machine Div., Bendix Aviation Corp. ....	83	Sheppard Diesels. ....	77
Electric Auto-Lite Co., The. ....	65	Sinclair Refining Co. ....	29
Elliott Company ....	Third Cover	Skinner Purifiers Div., Bendix Aviation Corp. ....	75
Engineering Controls, Inc. ....	85	Sonoflux Corporation. ....	94
Erie Forge Co. ....	24	Standard Oil Co. of Calif. ....	21
Fairbanks, Morse & Co. ....	17	Standard Oil Co. (Indiana) ....	13
Federal-Mogul Corp. ....	20	Standard Pressed Steel Co. ....	92
Fitzgerald Manufacturing Co., The. ....	96	Struthers Wells Corporation. ....	83
Fram Corporation ....	77	Synchro-Start Products, Inc. ....	92
Fulton Iron Works Company. ....	12	Texas Co., The. ....	Second Cover-1
General Motors Corp., Cleveland Diesel Engine Div. ....	2	Thomas Flexible Coupling Co. ....	86
Delco-Remy Div. ....	11	Tide Water Associated Oil Co. ....	8
Detroit Diesel Engine Div. ....	4	Tuthill Pump Company. ....	75
Harrison Radiator Div. ....	19	Twin Disc Clutch Co. ....	25
Griscom-Russell Co., The. ....	10	Union Diesel Engine Co. ....	91
Gulf Oil Corp. ....	32	U. S. Hoffman Machinery Corp. ....	73
Guth Company. ....	94	Van Der Horst Corp. of America. ....	79
Harrison Radiator Div., General Motors Corp. ....	19	Vellumoid Co., The. ....	95
Hemphill Schools, Inc. ....	90	Walworth Co. ....	22
Hill Diesel Engine Co. ....	90	Westinghouse Electric Corporation. ....	28
Hill-Johnson Engineering Co. ....	91		
Homs-Hughes Co. ....	87		
Honan-Crane Corp. ....	80		

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